

Foreword



National
Oceanic and
Atmospheric
Administration



U.S.
DEPARTMENT
OF
COMMERCE

NOAA Fisheries Service Northeast Cooperative Research Partners Program

The National Marine Fisheries Service (NOAA Fisheries Service), Northeast Cooperative Research Partners Program (NCRPP) was initiated in 1999. The goals of this program are to enhance the data upon which fishery management decisions are made as well as to improve communication and collaboration among commercial fishery participants, scientists and fishery managers. NOAA Fisheries Service works in close collaboration with the New England Fishery Management Council's Research Steering Committee to set research priorities to meet management information needs.

Fishery management is, by nature, a multiple year endeavor which requires a time series of fishery dependent and independent information. Additionally, there are needs for immediate short-term biological, oceanographic, social, economic and habitat information to help resolve fishery management issues. Thus, the program established two avenues to pursue cooperative research through longer and short-term projects. First, short-term research projects are funded annually through competitive contracts. Second, three longer-term collaborative research projects were developed. These projects include: 1) a pilot study fleet (fishery dependent data); 2) a pilot industry based survey (fishery independent data); and 3) groundfish tagging (stock structure, movements and mixing, and biological data).

First, a number of short-term research projects have been developed to work primarily on commercial fishing gear modifications, improve selectivity of catch on directed species, reduce bycatch, and study habitat reactions to mobile and fixed fishing gear.

Second, two cooperative research fleets have been established to collect detailed fishery dependent and independent information from commercial fishing vessels. The original concept, developed by the Canadians, referred to these as "sentinel fleets". In the New England groundfish setting it is more appropriate to consider two industry research fleets. A pilot industry-based survey fleet (fishery independent) and a pilot commercial study fleet (fishery dependent) have been developed.

Additionally, extensive tagging programs are being conducted on a number of groundfish species to collect information on migrations and movements of fish, identify localized or subregional stocks, and collect biological and demographic information on these species.

For further information on the Cooperative Research Partners Programs please contact:

National Marine Fisheries Service (NOAA Fisheries Service)
Northeast Cooperative Research Partners Program

(978) 281-9276 – Northeast Regional Office of Cooperative Research
(401) 782-3323 – Northeast Fisheries Science Center, Cooperative Research Office, Narragansett
Laboratory

www.nero.noaa.gov/StateFedOff/coopresearch/

Date: March 8, 2005
NMFS Grant No. 50-EANF-1-00010



**Final Report: Developing a raised footrope whiting net
in the Gulf of Maine that meets conservation goals
for size selectivity and bycatch.**

1/1/01 - 12/31/02

Submitted by:
Daniel F. Schick
Maine Department of Marine Resources
P.O. Box 8
West Boothbay Harbor, Maine 04575

Developing a raised footrope whiting net in the Gulf of Maine that meets conservation goals for size selectivity and bycatch.

1. Project Summary and Statement of Research Question:

1. Project Summary

The work done under the current NMFS grant built on the successes in 1999 and essentially completed development of a net that better targets whiting by meeting the double criteria of conservation of the whiting resource and minimization of bycatch of regulated species. Through a series of tests of cod end mesh, raised footrope configurations with and without a roller frame, taking the configuration with the least bycatch from each test, the current research developed a net that met the criteria. This net is a raised footrope sweepless trawl with dropper chains that has a 50 mm bar space Nordmore style grate and 2-1/2 inch stretched mesh cod end. Whiting length frequency retained with this net shows few whiting retained below 22 cm, or roughly size at first maturity. The percentage of bycatch of regulated species is less than 5% for all but a few tows. Continued work during the summer and fall of 2002 with the fishermen involved ensured that proper design and rigging instructions could be developed that would be easily followed, fished and enforced. Sixteen tows with 2-1/2 inch cod end mesh paired with tows with 3 inch cod end mesh conducted during the fall of 2002 showed little difference in length frequency of whiting or in bycatch of regulated species between the two cod ends.

With the completion of this gear development work, Maine worked with the New England Fishery Management Council's Whiting Monitoring Committee on a framework adjustment to create this fishery. This framework adjustment, FW 38, is very specific as to what types of gear may be used in the fishery, ie a raised footrope net with a 50 mm bar space grate and a 2-1/2 inch diamond mesh cod end and defines an area where and a specific time period when the fishery can occur (See Appendix I).

There was a very large whiting fishery along the coast during the 1960's and early 70's and a reasonable fishery during the 1980's, there were little landings during the late 1980's and early 1990's. In 1994, an innovation that helped reduce finfish bycatch in the shrimp fishery, the Nordmore grate, was modified to allow a slightly larger size whiting through the grate, yet keep the bycatch of regulated species down below 5%. The grate bar spacing was widened to 40 mm from 25 mm and testing at sea showed good success at catching whiting and keeping bycatch low. There was no whiting management plan in place at that time and the size fish targeted by this gear, 1 3/4" mesh net and 40 mm bar space grate, was salable in the Spanish whiting market if properly handled on deck to preserve quality. This fishery existed as an experimental fishery under NMFS regulation under the proviso that it proves that its bycatch is less than 5%. Data between sea sampling and logbooks differed as to bycatch percentage. As this work progressed, Amendment 12 to the Northeast Multispecies Fishery Management Plan (MSFMP) was approved in 1999, creating a management plan for the whiting fishery. This plan limited the whiting fishery to only two locations in the Gulf of Maine, Area 1 off Cape Ann, Massachusetts, and Area 2 outside Jeffrey's Ledge. Neither is accessible to the inshore Maine whiting fleet. Submitted in May, 2000, Framework Adjustment 35 to the Northeast MSFMP has allowed an additional whiting fishery north of Cape Cod through use of a raised footrope net. This area has recently been expanded, but is also inaccessible to the Maine fleet. Thus the traditional Maine whiting fishery has been systematically regulated out of existence.

Understandably, after several years of issuing experimental fishing permits for the Maine fishery to prove its worth, the NMFS in 2000 was reluctant to continue to issue experimental fishery permits to sustain the Maine fishery with the whiting grate. Maine fishers hoped that a whiting fishery closer to Maine could be created through another framework adjustment to reestablish this traditional fishery. In order to do so in good conscience, Maine fishers wanted to use the best possible combination of attributes in the net that would meet the dual criteria of low bycatch and conservative size selection for whiting. Amendment 12 to the MSFMP had established a series of increasing limits on daily catch based on decreasing cod end mesh size, which was aimed at limiting the mortality of pre spawning fish.

With a grant from the Maine Fishing Industry Development Program, we continued to work to bring the fishery into compliance with the intent of the whiting fishery management plan to reduce the fishing mortality on juvenile (pre-spawning) whiting. To these ends we investigated increased mesh sizes in the cod end, the addition of a Nordmore style grate into the extension with varying bar spacings and the addition of a modified Massachusetts-style raised footrope to the trawl. Our work met with good success in reducing the catch of small whiting and the bycatch of regulated species. The bycatch of regulated species is calculated as the ratio of the weight of regulated species and the total weight of fish caught. Thus when you greatly reduce the total weight of fish caught by

increasing the cod end mesh to release the small whiting, you run the risk of increasing the percent of bycatch of regulated species, even if you have effectively reduced their actual bycatch. This work ended with a series of trials with a raised footrope that was designed to reduce the bycatch of flatfish and thus bring the bycatch percentage back below 5%. The trials were promising, but not complete enough to be sufficient to recommend their use in the fishery. Also, the video footage that we felt was necessary to document what was happening with the gear while under tow was not clear enough. The current work has addressed these issues and cleared the way for the creation of a whiting fishery along the Maine coast through a framework adjustment (FW 38) to the MSFMP.

Study Design

The project goal for the CRPI grant was to complete the development of a whiting net that can be fished in the Gulf of Maine while successfully meeting the conservation needs of the whiting resource and maintaining acceptably low bycatch levels. The objectives towards this goal were: i. To obtain good video footage of the interaction between the gear and fish and the gear and the bottom. ii. To test 2-1/2" diamond mesh and 2-1/4" square mesh cod ends with a 50 mm bar space grate in combination with a raised footrope net configuration with 30 inch dropper chains both with and without a roller frame for whiting selectivity and bycatch reduction. iii. To sea trial the best combination with several fishers to generate feedback as to the gear's behavior under commercial conditions. iv. To gain acquaintance with and acceptance of the gear within the whiting fishing community.

The testing of the gear involved two vessels conducting paired tows of the test gear and a suitable control net. The catch for experimental and control tows was separated by species and each species weighed, counted and measured for length frequency. Adequate personnel, usually two individuals, were on board each vessel to separate and measure the catch. Comparisons of the diamond and square mesh cod ends were made based on catch and size frequency to determine their equivalence. The video work captured the fishing character of the gear and the behavior of the fish at the footrope of the net. The fishing characteristics of the net were videoed in shallow, clear water. The Scanmar net mensuration gear was unavailable for measuring the net opening width and height and height off the bottom.

Timetable

Timetable	2001												2002				2003	2005
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Sep	Oct	Nov	Dec	Jan	Mar
Permit applications	*	*																
Gear ordering, constr.	*	*	*															
RFP Sea Sampling		*	*															
RFP Vessel Support			*	*														
Video, Scanmar use contr.				*														
Commercial trials sched.				*		*	*	*										
Raised footrope nets constr.							*											
Video, Scanmar net work							*											
Analysis of video							*	*										
Gear trials							*	*										
Sweepless trawl trials (ext.)													*	*	*	*	*	
3" Cod end trials (ext.)															*			
Analysis of trial results							*	*										
Commercial trials							*	*					*	*	*	*	*	
Data entry, analysis							*	*	*	*			*	*	*	*	*	
Final report										*	*	*				*	*	*
(ext.) = grant extension work																		

Results:

The results of the testing done during the fall of 1999 of the raised footrope trawl with 50 mm bar space grate and 2.6 inch diamond mesh cod end against a control net consisting of a footrope down on the roller frame, a 40 mm bar space grate and 1-3/4 inch diamond cod end were reviewed. See Appendix II for summary results on

catch, bycatch, percent bycatch of regulated species and catch and bycatch by species for the grate bar spacing and cod end mesh trials and the raised footrope trials with 42 inch and 30 inch dropper chains to a roller sweep, or no sweep. Based on those results, it was decided that the reduction in bycatch of regulated species was convincing enough that the current series of tests should concentrate on determining the difference in bycatch of regulated species created by the addition of the raised footrope. Thus the control net was redesigned as being the same as the test net with respect to the bar spacing in the grate and the cod end mesh, but with short dropper chains, bringing the footrope down on top of the roller frame. It was also decided that the video work should be done first to give us the assurance that the nets were properly deploying as designed.

The video documentation was done aboard the F/V Jerry & Joe III during July, 2001. Mike Pol and Arne Carr from Mass. DMF brought their U/W video camera up to Portland and over a period of 3 days were able to generate the footage needed to show that the raised footrope net with and without a roller frame was fishing correctly.

A tow schedule was prepared for the paired tow testing of the nets (See Diagram 1). Paired tows were conducted between September 15, 2001 and October 2, 2001 and tested two net configurations. A second, shorter set of paired tows was done between October 3 and 5, 2001 comparing 2.2" square mesh and 2.6" diamond mesh in the cod ends. A series of 71 tows conducted over 20 days of fishing between October 9 and November 27, 2001 provided commercial trials for the 30" raised footrope with no sweep, 50 mm grate and 2.6" diamond cod end configuration dubbed the 'bottom friendly net' as it has very little contact with the bottom. The two vessels that finally contracted to do the paired towing work were the F/V North Star and F/V Tenacious, Captains Vincent Balzano and Proctor Wells, respectively as the F/V Jerry & Joe sank at the dock and was unable to continue with the work. The F/V North Star was the only vessel to bid on conducting the commercial trials and so was awarded the entire 20 days for the commercial trials.

The paired tows were conducted in five sets. The first set compared the raised footrope trawl with 30 inch dropper chains and 10 inch diameter roller frame towed from the F/V North Star to a control net with no dropper chains and a 10 inch diameter roller frame towed from the F/V Tenacious. Both nets had a 50 mm bar space grate and 2.6 inch diamond cod end. There were 8 paired tows in this set and the per tow information for date, time, gear, location, depth, weight of catch, weight of regulated species bycatch and percent of regulated species bycatch are found in Table 1. This raw data showed the F/V North Star caught more total fish and less regulated species with the raised footrope net for a mean percent bycatch of 7.5% than did the F/V Tenacious with 14.9% with the control net. The length of tow between pairs was not always completely comparable, so the catch, bycatch and percent bycatch have been standardized to a per hour towing basis and are presented on both a per tow and a per trip basis (Table 2). In this initial set of tows, some tow information was not recorded, so per hour information is not complete. The percent bycatch showed some marginal improvement, with 18.3% for the control and 4.3% for the raised footrope net. Individual species catches in weight for the raised footrope with roller frame tows and the control net tows are summed in Table 3a and catch in numbers are summed in Table 3b for the raw data. Mean catch in wt per hour tow by species for the two nets is listed in Table 4. The majority of the catch in all tows was whiting and red hake. White hake, American plaice and gray sole comprised the bulk of the bycatch of regulated species. Selected species weights and numbers by paired tow for the raw data are compared for the two nets in Table 5. American plaice, gray sole and white hake were selected because they are the major bycatch species and they represent the two basic fish shapes, flat and round. Red hake and silver hake were chosen as they were the major components of the catch and monkfish was chosen as it is a commercially important bottom dweller that wouldn't fare well in cod end selectivity due to its shape and thus shouldn't be allowed to enter the net. The F/V North Star with the raised footrope net with frame caught more fish in general than did the F/V Tenacious with the control net as seen in the paired tows. Silver hake and red hake were higher and the bycatch of gray sole was up, but the bycatch of white hake and American plaice were about the same, producing a lower percent bycatch for the raised footrope net. Length frequency and percent length frequency of the same selected species for the raised footrope with roller frame and control nets show little difference in size selectivity between the two nets (Figures 1&2).

The third set of paired tows repeated the set, but with the net from the Tenacious rigged as the raised footrope trawl with inch dropper chains and 10 roller frame and the F/V North Star's net rigged as control. There were 9 paired tows in this set. The tow information is found on bottom half of Table 1 and shows the F/V Tenacious caught about half as much as the F/V North Star for total catch and bycatch and had about the same percent bycatch of regulated species, 8.4% vs 7.7%. The catch, bycatch and percent bycatch hour tow and per trip for this set are found in Table 2 and show the same general characteristics with around bycatch for both nets. Individual species catches in weight for the tows in the set are summed in Table 6a the catches in numbers are summed in Table 6b for the data. Mean catch in wt per tow by species for the two in the third set is listed in Table 4. The experimental caught about half the whiting, which was the bulk the catch, but about the same amount of red hake white hake. The weight of dabs and gray sole was about half that of the control. Selected species weights and numbers by paired tow for the raw data, compared for the two nets in Table 7 showed no remarkable fluctuations in catches between tows. While there were reductions the amount of flatfish taken, most noticeable result was large reduction in monkfish the raised footrope net. Length frequency and percent length frequency for selected species from this second set for the raised footrope with roller frame and control nets show little difference in size selectivity between the two nets (Figures 3&4). The length frequency data

Diagram 1:

Paired Towing Schedule: F/V North Star and F/V Tenacious.

Tows should be between one and two hours duration, of equal time between vessels for each pair of tows and as many pairs of tows as can reasonably be done in a day's fishing. IE, if 2 hour tows, 5 or 6 pairs might be done. If 1 hour tows are done, 10 to 12 pairs might be done. Tow time may be tuned to how long it takes to measure up a tow of fish.

Tow logs and length frequency logs are to be the standard NMFS sea sampling logs.

Gear to be tested: Net with grate bar spacing of 50mm and cod end mesh size of 63.5mm (2-1/2") diamond mesh (DIA), or 56mm (2-1/4") square mesh (SQ) and

1. Raised footrope w/dropper chains only (F1)

2. Raised footrope w/roller frame (F2)

Control net: Shrimp mesh w/ grate bar spacing of 50mm and cod end mesh size of 63.5mm (2-1/2") w/ footrope down on roller frame (C).

Tow schedule:

Day 1:

Raised Footrope w/roller frame vs control

Vessel 1	Vessel 2
F1	C
F1	C
F1	C
F1	C
F1	C

Day 2:

Raised Footrope w/no roller frame vs control

Vessel 1	Vessel 2
F2	C
F2	C
F2	C
F2	C
F2	C

Day 3:

Raised Footrope w/roller frame vs control

Vessel 1	Vessel 2
C	F1
C	F1
C	F1
C	F1
C	F1

Day 4:

Raised Footrope w/no roller frame vs control

Vessel 1	Vessel 2
C	F2
C	F2
C	F2
C	F2
C	F2

Day 5:

Raised Footrope w/roller frame vs control

Vessel 1	Vessel 2
F1	C
F1	C
F1	C
F1	C
F1	C

Day 6:

Raised Footrope w/no roller frame vs control

Vessel 1	Vessel 2
F2	C
F2	C
F2	C
F2	C
F2	C

Day 7:

Raised Footrope w/roller frame vs control

Vessel 1	Vessel 2
C	F1
C	F1
C	F1
C	F1
C	F1

Day 8:

Raised Footrope w/no roller frame vs control

Vessel 1	Vessel 2
C	F2
C	F2
C	F2
C	F2
C	F2

Day 9:

Raised Footrope w/roller frame: 2.2 inch Sq mesh cod end vs 2.6 inch Diamond mesh cod end.

Vessel 1	Vessel 2
SQ	DIA
DIA	SQ
DIA	SQ
SQ	DIA
SQ	DIA
DIA	SQ

Day 10

Raised Footrope w/dropper chains only: 2.2 inch square mesh cod end vs 2.6 inch diamond mesh cod end.

Vessel 1	Vessel 2
SQ	DIA
DIA	SQ
DIA	SQ
SQ	DIA
SQ	DIA
DIA	SQ

first
F/V

30
inch

the

per
the

fish
both
thus

per
third

8%

third
and

raw
hour
nets

net

of

and
the

in
the
the
with

shows much fewer flatfish (plaice, sole), monkfish and silver hake caught with the raised footrope with frame net than with the control and about the same number of red and white hake, but no changes in the relative numbers at size. The difference between the two net/vessel combinations shows the F/V North Star caught more fish than the F/V Tenacious in both the raised footrope and control configurations and this confounds the comparison between gear.

If you compare each vessel to itself, raised footrope to control, in both cases the raised footrope net reduced the bycatch and percent bycatch of regulated species by about half, from 25 kg to 12 kg, or 18% to 8% for the Tenacious and from 22 kg to 11 kg, or 9% to 4% for the North Star (Table 2).

The second set of paired tows compared the raised footrope trawl with 30 inch dropper chains and no roller frame towed from the F/V North Star to a control net with no dropper chains and a 10 inch roller frame towed from the F/V Tenacious. Both nets had a 50 mm bar space grate and 2.6 inch diamond cod end. There were 9 paired tows in this set and the per tow information for date, time, gear, location, depth, weight of catch, weight of regulated species bycatch and percent of regulated species bycatch are found in Table 8. Of the 9 tow pairs, two of the experimental tows were no good, leaving 7 paired tows. The raised footrope with no roller frame trawl caught a third less fish than the control, but the bycatch was reduced from 45 kg to 6 kg, or 20% down to 3%. The catch, bycatch of regulated species and percent bycatch, standardized to a per hour towing basis are presented on a per tow basis and the tows are summed to a per trip basis (Table 2). The percent bycatch reduction is the same, 20% down to 3%, whether calculated on a per tow or a per trip basis. Individual species catch in weight for the raised footrope with no roller frame tows and the control net tows are summed in Table 9a and catch in numbers are summed in Table 9b for the raw data. Mean catch in wt per hour tow by species for the two nets is listed in Table 10. Selected species weights and numbers by paired tow for the raw data are compared for the two nets in Table 11. Length frequency and percent length frequency for selected species for the raised footrope with no roller frame and control nets show little difference in size selectivity between the two nets except for monkfish, which were not captured as frequently at the smaller sizes with the raised footrope net (Figures 5&6).

The fourth set of paired tows repeated the second set, but with the net from the F/V Tenacious rigged as the raised footrope trawl with 30 inch dropper chains and no roller frame and the F/V North Star's net rigged as the control. There were 10 paired tows in this set. The raw per tow information, on the bottom half of Table 8, shows the control caught about twice what the experimental net. This isn't surprising as the North Star regularly out-fished the Tenacious in these trials. The sweepless raised footrope trawl caught about a third as much regulated species as the control, so the percent bycatch was less, 2.9% vs 5.0%. The catch, bycatch of regulated species and percent bycatch, standardized to a per hour towing basis are presented on a per tow basis and the tows are summed to a per trip basis (Table 2). The per trip percent bycatch was 4.6% for the control and 3.0% for the sweepless raised footrope net. Individual species catch in weight for the raised footrope with no roller frame tows and the control net tows are summed in Table 12a and catch in numbers are summed in Table 12b for the raw data. As with the first set of paired tows with the sweepless net, the raised footrope caught a lower amount of flatfish relative to the control than it did white hake. Flats were reduced by 75% compared to 65% for white hake and 53% for silver hake. Mean catch in wt per hour tow by species for the two nets shows the same differences (Table 10). Selected species weights and numbers by paired tow for the raw data compared for the two nets again shows monkfish being caught in consistently very low numbers with the raised footrope trawl and flatfish released more than white hake (Table 13). Length frequency and percent length frequency for selected species for the raised footrope with no roller frame and control nets show little difference in size selectivity between the two nets even for the monkfish (Figures 7&8).

The fifth series of paired tows were made using diamond and square mesh cod ends to see if any difference in size selectivity was detectable. The diamond mesh was the same 2.6 inch mesh used throughout these experiments and the square mesh was 2.2 inch mesh stretched measure. Eight paired tows were made in all with the square mesh towed for four tows by each vessel. Both vessels used the raised footrope sweepless trawl, the raised footrope with sweep and the footrope down on the sweep in various tow pairings (Table 14). Length frequency comparisons for selected species showed no striking differences in selectivity for any species, although there may have been some increased release of small gray sole through the diamond mesh (Figure 9).

The F/V North Star used the sweepless trawl for another 20 days in October and November 2001 as part of the commercial testing/introduction segment of the work. A total of 71 tows were made of which 65 were good, clear tows without problems. The per tow information as well as the catch, bycatch of regulated species and percent bycatch are found in Table 15 and show very low bycatch (2.2 kg/hr) and percent bycatch (2.5%) of regulated species even though the whiting are no longer available inshore in any appreciable numbers at this time of the year (69.6 kg/hr).

During the fall and early winter of 2002-03, a series of tows were made from September through January, 03 using the 50mm bar space grate raised footrope sweepless trawl with 2-1/2 inch mesh cod end to document catch

of whiting and bycatch of regulated species over a wide area along the coast of Maine to define what area to ask for in Framework 38 for the fishery. Also, a final set of paired tows was conducted during the fall of 2002 to compare catch and bycatch with 3" cod end mesh compared to 2-1/2" mesh. The F/V North Star and F/V Tenacious were involved in both efforts. The F/V Tenacious towed the gear in September, 2002, December, 2002 and January, 2003 and made 21 tows that were free of troubles. The date, location, depth and other tow characteristics as well as total catch, whiting catch and regulated species catch and percent regulated species by tow and by trip are recorded in Table 16. Mean percent bycatch of regulated species was 3.79% per tow and 3.59% per trip. Occasional high percent bycatch were created by low levels of whiting in a tow with no increase in the regulated species caught over other tows (Table 16). Catch rates by species for each tow showed consistently low levels of bycatch dominated by herring and alewives (Table 17). Occasionally spiny dogfish would get tangled in the funnel in front of the grate and were weighed and measured as part of the catch. They were too large to go through the grate, so in a sense shouldn't be counted. The summary of total catch per tow and mean catch per tow by species shows a mean percent regulated species of 3.5% (Table 18). If the dogfish are removed from the total catch, the percent bycatch of regulated species rises to 4.5%, which is still respectable. The length frequency of whiting taken with this gear shows that the majority of whiting are over the minimum size for sexual maturity, 22 cm (Figure 10) which meets the goal of conserving the stock by limiting fishing mortality on juvenile fish.

The F/V North Star made 43 tows during October and November, 2002 of which 36 were good, clean tows without tearups, hangs, or using other gear. These tows complemented the tows made by the F/V Tenacious to provide a continuous series of tows throughout the fall. The date, location, depth and other tow characteristics as well as total catch, whiting catch, regulated species catch and percent regulated species by tow and by trip are recorded in Table 19. They show variable levels of catch in all three categories and two extraordinary catches of redfish, bumping the percent bycatch of regulated species for those tows to 39% and 58%. These helped to raise the mean percent bycatch of regulated species per trip to 5.80%, where without them, it would have been 3.19% for the 11 trips made. The catch by species per tow and percent bycatch regulated species per tow show a steady, low level of catch for the regulated species with the few notable exceptions (Table 20). Sometimes these translate into high bycatch percentages if the whiting catch is low for that tow. The summary total catch per tow and mean catch per tow by species shows the major regulated species bycatch to be redfish, followed by white hake, American plaice and gray sole with a percent bycatch of 5.11% (Table 21). The length frequency of whiting for this series of tows (Figure 11) is very similar to that for September, December and January (Figure 10). The percent length frequency for the two tow series shows that the whiting caught by the F/V North Star in October and November are a little larger on average, by about a centimeter (Figure 12). No difference in the gear is apparent, so it may be that the location fished was a little different, or that the size frequency available to the gear was slightly different during that period.

The length frequencies for the regulated species taken by the F/V North Star show a bimodal distribution for redfish, but the other three species, white hake, American plaice and grey sole are all unimodal in their size distribution (Figure 13). The frequencies are for total catch and show that redfish was the dominant regulated species in the catch. While white hake was second in weight, it was third in numbers behind American plaice, but was comprised of larger individuals. The mean size of grey sole retained was larger than the mean size for American plaice, perhaps indicating a difference in cod end mesh selectivity based on the body firmness of the fish.

The frequency of tows exhibiting low levels of bycatch of regulated species is much greater than the frequency of tows with high levels. 80% of the 61 tows made between the two vessels showed bycatch level below 5% (Figure 14). The distribution of bycatch of individual regulated species by tow shows the rare high bycatch level of redfish and the more even elevated level of bycatch of white hake (Figure 15). The other species show variable, but generally low levels of take.

The distribution of bycatch of regulated species over the season and over depth was of interest in deciding what time of year to ask for in a fishery and what area along the coast to ask for in generating a fishery for whiting. The distribution of bycatch by depth showed little change over a depth range of 48 to 89 fathoms (Figure 16). The two high redfish catches were both in water over 70 fathoms, but other than those two tows, there is only a slight rise in bycatch levels with increasing depth. Indeed if you look at the total catch, whiting catch and regulated species catch per tow distribution over depth, there is a wide variability, but no discernable change with depth. The R squared values for linear regression with depth show no pattern associated with depth for any of the three catch levels (Figure 17). The percent bycatch of regulated species shows no relationship with total catch, however, the two high percent bycatch of redfish tows were both associated with lower than average total catch as were the two elevated white hake percent bycatch levels, thus there seems to be a greater chance of high percent bycatch if the total catch is low (Figure 18). The distribution of percent bycatch of regulated species over time from September,

2002 through January, 2003 showed no discernable change over time (Figure 19). All of the high bycatch levels (over 10%) occurred mid-season between mid October and mid November.

A comparison of catch and bycatch between 2-1/2 inch and 3 inch cod end mesh was carried out in November, 2002 using the Grate raised footrope sweepless trawl. A series of 16 paired tows were made with the F/V Tenacious and the F/V North Star. Cod ends were switched between vessels to provide an even split between the two vessels of experimental and control cod ends and to negate vessel effects. The date, location, depth and other tow characteristics as well as total catch, whiting catch, regulated species catch and percent regulated species by tow are recorded in Table 22. The catch by species by tow for the 3 inch cod ends shows variable catch rates for all species with whiting catches ranging from 4.4 kg to 90 kg (Table 23). In general, when whiting catch rates are high, percent bycatch is low. A few tows showed elevated catches of white hake, American plaice and grey sole relative to whiting, and one tow showed a very high catch of redfish, producing a high percent regulated species bycatch of 80%. This was also due in part to a comparatively low whiting catch. Only five of the 16 tows with the 3 inch cod end produced a bycatch of less than 5% and the mean regulated species bycatch rate was 20% (Table 23). The mean catch per 60 minute tow for 3 inch cod end tows was 10.6 kg, which was somewhat higher than the catch of regulated species for the tows done with the 2-1/2 inch cod end during the fall, 5.8 kg and the average total catch, 66.8 kg was lower than the average of 100.5 kg for the 2-1/2 inch cod end tows. Thus the high percent bycatch is due to a combination of higher bycatch weights and lower total catch weights. The 2-1/2 inch cod end fared a little better in percent bycatch of regulated species with a range of 3.2% to 28.3% and a mean of 10.7% for a 60 minute tow discounting the spiny dogfish catch (Table 24). The primary purpose of these tows was to see if the 3 inch cod end could be used to catch whiting and still maintain low bycatch. The bycatch of regulated species between the two cod ends was pretty comparable if the catch of large dogfish ahead of the grate was discounted and the one high redfish tow was discounted, producing 11.5% +/- 0.072 std. dev. for the 2-1/2 inch cod end and 9.2% +/- 0.065 std. dev. for the 3 inch cod end (Tables 23, 24). The summed catch by species and the mean catch by species for a 60 minute tow for the two cod ends (Table 25) shows that the distribution of fish for both cod ends is dominated by whiting and red hake, with white hake, American plaice and grey sole and an occasional high take of redfish comprising the majority of regulated species bycatch. The length frequency for the whiting retained showed little difference between the two cod ends (Figure 20) and both retain whiting predominantly over minimum spawning size. Thus from a whiting conservation standpoint, either cod end would be acceptable.

Summary of results and discussion: The raised footrope with the roller frame was tested in two sets of paired tows with the gear reversed between vessels between the two sets. In one set, the percent bycatch was reduced significantly to a level below 5% and in the other set it remained the same, at about 8%. These results are confounded by one vessel catching consistently more than the other, regardless of gear used. If you compare each vessel to itself, you see that the raised footrope with roller frame reduced the weight of bycatch to about half and in one case that brought the percent bycatch below 5% and in the other case it didn't. This may be helpful as the difference in how the two vessels had rigged their gear will be instructive in describing just how nets must be rigged in order to achieve the desired reduction in bycatch. Future work to be done this summer should shed light on this issue.

The raised footrope with no roller frame, dubbed the bottom friendly net, was also tested with two sets of paired tows and proved to reduce bycatch and percent bycatch better than the raised footrope with the roller frame achieving much less than 5% in both pairings. The difference between the nets in overall catch was still evident, but the bycatch weight reduction was sufficient to overcome this difference and produce low percent bycatch levels.

Differences between the two raised footrope nets and their respective control nets in catch of individual regulated species were consistent. Both raised footrope configurations did a better job of reducing flatfish and monkfish bycatch than they did white hake bycatch, however white hake bycatch was reduced as well.

No appreciable differences in size selectivity were observed between any of the trials, including the diamond mesh versus square mesh cod ends. This is not surprising as the nets used in all trials except the square mesh vs diamond mesh trials used the same grate bar spacing and cod end mesh for both experimental and control nets. The difference between them was in the configuration of the footrope.

During the fall of 2002 we further tested the raised footrope without a sweep for several reasons. It is important to understand what level of description of the gear is needed to put a fishery in place based on the successful use of this gear. Tows were conducted over a wide area as the scope of what area is eventually opened to whiting fishing may well depend on what area we have data from. Also, we developed a time series of samples to test for changes in bycatch with season and tested for variation in bycatch with depth. There were only slight

differences in bycatch with season, depth and location, justifying the request for a whiting fishery over a respectable area of bottom and over several months a year.

Testing the 3 inch diamond stretch mesh cod end in conjunction with the 50 mm bar space grate and raised footrope without a roller frame for bycatch was done because this mesh size is the current default mesh in the whiting FMP. If a Gulf of Maine whiting fishery is created based in part on this research and the default mechanism is invoked, the fishery may close as we would have no data on what bycatch would be with the 3 inch mesh. While the percent bycatch of regulated species was higher during these 3 inch cod end trials for both the 3 inch cod end and the 2-1/2 inch cod end, even compared to tows done around the same time of year with the 2-1/2 inch cod end, they were not wildly different from each other and were influenced by low total catch rates and occasional high bycatch rates.

Overall, the testing of the raised footrope sweepless trawl with 50 mm bar spacing in the grate over the past three years has shown uniformly low bycatch levels of regulated species over a wide range of locations, times of the year and depths. A total of 174 tows were made with a mean percent bycatch of regulated species of 3.9% with a standard deviation of 5.78. This data was sufficient to allow Framework Adjustment 38 to be approved by the New England Fishery Management Council, reinstating a whiting fishery along the Maine coast.

Principal Investigator Contact Information:

For further information concerning this project, please contact Daniel Schick, Maine Dept. Marine Resources, P.O. Box 8, W. Boothbay Harbor, ME 04575. Telephone (207) 633-9500, FAX (207) 633-9579, email dan.schick@maine.gov.

Table 1. Two Sets of Paired Tows 30" Raised Footrope w/Frame vs Control Footrope Down on Frame.
Both Nets with 50 mm Bar Space Grate and 2.6 Inch Diamond Mesh Cod End.

Test: 30" Raised Footrope w/Frame vs Control Footrope Down on Frame.
 North Star = Experimental

Vessel	Date	Grate (in)	Cod End (in)	Dropper (in)	Roller Dia (in)	Tow	Begin Time	End Time	Beginning Lat/Long		End Lat/Long		Water Temp (°F)	Depth Haul (fm)	Tow Speed (kt)	Wire Out (fm)	Total Weight (kg)	Reg. Sp. Wt. (kg)	% Reg.Sp.
									Decimal degrees		Decimal degrees								
Tenacious	9/15/2001	2	2.6	0	10	1	6:42	7:37	43.541	70.011	43.570	69.976	0.0	51.7-62.2	2.6	150.0	63.1	11.2	17.7
Tenacious	9/15/2001	2	2.6	0	10	2	8:11	9:12	43.565	69.979	43.532	69.942	0.0	54.9-62.9	2.6	150.0	154.4	30.6	19.8
Tenacious	9/15/2001	2	2.6	0	10	3	10:02	11:05	43.514	69.916	43.525	69.901	0.0	63.1-59.6	2.6	150.0	270.4	70.8	26.2
Tenacious	9/16/2001	2	2.6	0	10	4	0:00	0:00					0.0	0	0.0	0.0	146.9	5.3	3.6
Tenacious	9/16/2001	2	2.6	0	10	5	8:54	0:00	43.607	69.863			0.0	47	2.5	125.0	118.8	8.8	7.4
Tenacious	9/16/2001	2	2.6	0	10	6	11:00	11:56	43.610	69.870	43.593	69.910	0.0	42-48	2.5	125.0	122.7	8.5	6.9
Tenacious	9/16/2001	2	2.6	0	10	7	12:30	13:39	43.579	69.933	43.556	69.938	0.0	48-57.8	2.5	150.0	103.3	16.1	15.6
Tenacious	9/16/2001	2	2.6	0	10	8	14:17	15:17	43.529	69.940	43.563	69.975	63.0	61	2.5	150.0	87.4	19.0	21.7
												Tenacious	2	2.6	0	10	1066.9	170.3	16.0
																Mean	133.4	21.3	14.9
																Median	120.8	13.7	16.7
North Star	9/15/2001	2	2.6	30	10	1	0:00	0:00		0.000		0.000	0.0	0	2.4	175.0	129.0	15.8	12.2
North Star	9/15/2001	2	2.6	30	10	2	0:00	0:00	43.557	69.974	43.527	69.937	0.0	60	2.4	175.0	*	*	*
North Star	9/15/2001	2	2.6	30	10	3	0:00	0:00	43.502	69.918	43.465	69.942	0.0	0	2.4	175.0	515.3	63.0	12.2
North Star	9/16/2001	2	2.6	30	10	4	7:22	8:25	43.968	69.886	43.594	69.860	0.0	0	2.4	125.0	261.5	3.0	1.1
North Star	9/16/2001	2	2.6	30	10	5	8:58	10:09	43.593	69.854	43.613	69.857	0.0	43	2.4	125.0	401.0	6.0	1.5
North Star	9/16/2001	2	2.6	30	10	6	11:05	11:57	43.605	69.859	43.596	69.893	0.0	45-48	2.5	125.0	210.5	5.5	2.6
North Star	9/16/2001	2	2.6	30	10	7	12:27	13:42	43.592	69.921	43.555	69.936	0.0	0	0.0	0.0	*	*	*
North Star	9/16/2001	2	2.6	30	10	8	14:25	15:26	43.523	69.937	43.551	69.968	0.0	60-56	2.5	175.0	197.7	30.8	15.6
												North Star	2	2.6	30	10	1714.9	124.0	7.2
																Mean	285.8	20.7	7.5
																Median	236.0	10.9	7.4

* Grate twisted, no data

* Grate twisted, no data

Test: 30" Raised Footrope w/Frame vs Control Footrope Down on Frame.
 Tenacious = Experimental

Vessel	Date	Grate (in)	Cod End (in)	Dropper (in)	Roller Dia (in)	Tow	Begin Time	End Time	Beginning Lat/Long		End Lat/Long		Water Temp (°F)	Depth Haul (fm)	Tow Speed (kt)	Wire Out (fm)	Total Weight (kg)	Reg. Sp. Wt. (kg)	% Reg.Sp.
									Decimal degrees	Decimal degrees	Decimal degrees	Decimal degrees							
North Star	9/22/2001	2	2.6	0	10	18	6:47	7:41	43.607	69.903	43.609	69.857	0.0	45	2.0	125.0	140.6	11.8	8.4
North Star	9/22/2001	2	2.6	0	10	19	7:57	9:04	43.607	69.861	43.619	69.866	0.0	42	2.4	125.0	162.5	10.1	6.2
North Star	9/22/2001	2	2.6	0	10	20	9:18	10:26	43.619	69.868	43.604	69.850	0.0	40	2.4	125.0	192.0	9.6	5.0
North Star	9/22/2001	2	2.6	0	10	21	10:38	11:50	43.603	69.851	43.597	69.905	0.0	45	2.4	125.0	226.8	10.6	4.7
North Star	9/22/2001	2	2.6	0	10	22	12:12	13:48	43.600	69.906	43.590	69.882	0.0	41	2.4	125.0	224.7	12.4	5.5
North Star	9/23/2001	2	2.6	0	10	23	5:55	7:08	43.524	69.904	43.485	69.947	0.0	58	2.4	175.0	329.3	32.0	9.7
North Star	9/23/2001	2	2.6	0	10	24	7:26	8:32	43.484	69.948	43.517	69.907	0.0	59	2.4	175.0	461.1	53.5	11.6
North Star	9/23/2001	2	2.6	0	10	25	9:17	10:28	43.513	69.910	43.477	69.949	0.0	62	2.4	175.0	475.1	59.5	12.5
North Star	9/23/2001	2	2.6	0	10	26	11:15	12:23	43.481	69.946	43.520	69.911	0.0	60	2.4	175.0	489.2	28.1	5.7
												North Star	2	2.6	0	10	2701.3	227.6	8.4
												Mean					300.1	25.3	7.7
												Median					226.8	12.4	6.2
Tenacious	9/22/2001	2	2.6	30	10	18	8:00	8:40	43.604	69.882	43.607	69.855	0.0	46-43	2.6	125.0	136.9	7.2	5.3
Tenacious	9/22/2001	2	2.6	30	10	19	9:03	10:06	43.607	69.869	43.628	69.904	0.0	46-43	2.6	125.0	121.7	10.8	8.8
Tenacious	9/22/2001	2	2.6	30	10	20	10:28	11:30	43.624	69.871	43.590	69.837	0.0	43-44	2.7	125.0	114.1	6.9	6.0
Tenacious	9/22/2001	2	2.6	30	10	21	11:48	13:04	43.616	69.867	43.592	69.896	62.6	44-43	2.7	125.0	137.2	5.3	3.9
Tenacious	9/22/2001	2	2.6	30	10	22	13:20	14:53	43.594	69.898	43.590	69.891	63.3	46-47	2.7	125.0	131.6	8.9	6.7
Tenacious	9/23/2001	2	2.6	30	10	23	7:08	8:09	43.514	69.906	43.482	69.946	64.0	60.8-64.7	2.7	175.0	143.8	14.1	9.8
Tenacious	9/23/2001	2	2.6	30	10	24	8:33	9:40	43.483	69.941	43.514	69.901	66.3	64-59.9	2.5	175.0	197.1	23.9	12.1
Tenacious	9/23/2001	2	2.6	30	10	25	10:24	11:26	43.505	69.905	43.473	69.942	64.5	66-63	2.5	175.0	193.6	27.2	14.0
Tenacious	9/23/2001	2	2.6	30	10	26	12:25	13:40	43.487	69.940	43.515	69.904	67.1	65-64	2.5	175.0	168.2	14.8	8.8
												Tenacious	2	2.6	30	10	1344.2	119.0	8.8
												Mean					149.4	13.2	8.4
												Median					137.2	10.8	8.8

Table 2. Comparison of Total Catch Weight/Hour Towing, Regulated Species Weight/Hour Towing and Percent of Regulated Species for Nets with 30" Dropper Chains to a 10" Roller Frame and 30" Dropper Chains with No Roller Frame versus Control Net with no Droppers and 10" Roller Frame. All Nets had a 50 mm Bar Space Grate and 2.6 Inch Diamond Cod End.

	Vessel	Grate (in)	Cod End (in)	Dropper (in)	Roller Dia (in)	Tot.Wt./Hr (kg)	Reg.Sp./Hr (kg)	% Reg.Sp.	% Reg.Sp. (Per Trip Basis)
30" Droppers and 10" Roller Frame vs Control									
1st Trial	Tenacious	2	2.6	0	10	786.85	151.85	19.30	
	Mean					131.14	25.31	18.00	18.30
	StdDev					69.12	21.90		6.59
	N					6	6		2
	North Star	2	2.6	30	10	1025.22	44.52	4.34	
	Mean					256.30	11.13	5.20	4.34
	StdDev					60.23	12.83		
	N					4	4		1
2nd Trial	North Star	2	2.6	0	10	2323.57	197.22	8.49	
	Mean					258.17	21.91	7.71	7.87
	StdDev					125.66	17.11		2.80
	N					9	9		2
	Tenacious	2	2.6	30	10	1264.74	111.00	8.78	
	Mean					140.53	12.33	8.39	8.74
	StdDev					40.89	7.32		3.85
	N					9	9		2
30" Droppers with No Frame vs Control									
1st Trial	Tenacious	2	2.6	0	10	2371.97	439.89	18.55	
	Mean					263.55	48.88	19.94	19.66
	StdDev					85.59	6.42		4.86
	N					9	9		2
	North Star	2	2.6	30	0	933.60	27.22	2.92	
	Mean					155.60	4.54	2.62	2.88
	StdDev					55.72	3.06		0.22
	N					6	6		2
2nd Trial	North Star	2	2.6	0	10	1760.04	81.27	4.62	
	Mean					176.00	8.13	5.92	4.59
	StdDev					59.95	4.02		1.03
	N					10	10		2
	Tenacious	2	2.6	30	0	875.67	26.21	2.99	
	Mean					87.57	2.62	2.76	2.96
	StdDev					39.70	2.41		0.70
	N					10	10		2

Table 3A. Catch in Weight per Tow by Species for 30" raised footrope with 10" roller frame (F/V North Star) vs control net with footrope down on 10" roller frame (F/V Tenacious). Both nets have 50 mm bar space grates and 2.6" diamond mesh cod ends.

Species	Tenacious Contr. 1	Tenacious Contr. 2	Tenacious Contr. 3	Tenacious Contr. 4	Tenacious Contr. 5	Tenacious Contr. 6	Tenacious Contr. 7	Tenacious Contr. 8	Tenacious	Tenacious	Tenacious	North Star Exper. 1	North Star Exper. 2	North Star Exper. 3	North Star Exper. 4	North Star Exper. 5	North Star Exper. 6	North Star Exper. 7	North Star Exper. 8	North Star	North Star	North Star
	Tot. Wt.	Tot. Wt.	Tot. Wt.	Tot. Wt.	Tot. Wt.	Tot. Wt.	Tot. Wt.	Tot. Wt.	Sum	Wt./Tow	Std.Dev.	Wt./Hr Tow	Tot. Wt.	Tot. Wt.	Tot. Wt.	Tot. Wt.	Tot. Wt.	Tot. Wt.	Tot. Wt.	Sum	Wt./Tow	Std.Dev.
Shrimp	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.000	0.0	0.0	1.8	0.0	0.0	0.0	0.0	0.0	1.8	0.3	0.714
Whiting/Silver Hake	21.5	62.5	150.5	96.4	54.3	58.5	39.5	30.0	513.2	64.2	41.783	59.8	83.5	385.0	198.0	210.0	155.0	90.0	1121.5	186.9	110.453	158.6
EXP Whiting	21.5	62.5	150.5	96.4	54.3	58.5	39.5	30.0	513.2	64.2	41.783	59.8	83.5	385.0	198.0	210.0	155.0	90.0	1121.5	186.9	110.453	158.6
Red Hake (Ling)	20.5	27.5	38.5	9.5	5.3	7.4	8.0	22.0	138.7	17.3	11.803	20.4	21.0	51.0	19.3	24.5	15.0	57.0	187.8	31.3	17.954	28.1
White Hake	0.2	6.5	25.0	2.0	3.8	3.0	3.4	3.5	47.4	5.9	7.907	6.9	1.3	10.0	0.0	0.0	1.5	4.0	16.8	2.8	3.822	1.3
Redfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.000	0.0
American Plaice (Dab)	7.6	15.0	22.5	2.7	3.6	3.9	9.1	9.5	73.9	9.2	6.707	11.1	8.0	22.0	2.8	4.0	3.3	11.0	51.0	8.5	7.343	5.1
Gray Sole (Witch Flounder)	1.3	8.5	22.9	0.3	0.3	0.1	2.3	5.5	41.2	5.2	7.763	6.7	3.5	31.0	0.0	0.8	0.5	14.3	50.0	8.3	12.333	3.8
Windowpane Flounder (Sand Dab)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.000	0.0
Winter Flounder (Blackback)	0.5	0.2	0.2	0.0	1.1	0.7	0.8	0.5	4.0	0.5	0.369	0.5	0.0	0.0	0.3	0.8	0.0	1.5	2.5	0.4	0.606	0.6
Yellowtail Flounder	0.7	0.4	0.3	0.3	0.0	0.8	0.5	0.0	3.0	0.4	0.294	0.4	0.0	0.0	0.0	0.5	0.3	0.0	0.8	0.1	0.209	0.2
Cod	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.106	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.000	0.0
Haddock	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.1	0.212	0.1	3.0	0.0	0.0	0.0	0.0	0.0	3.0	0.5	1.225	0.0
Pollock	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.000	0.0
Gulf Stream Flounder	0.0	0.0	0.0	0.0	1.6	4.3	0.1	1.0	7.0	0.9	1.509	0.9	0.0	0.0	0.0	8.3	4.3	0.0	12.5	2.1	3.467	3.0
Ocean Pout	0.0	0.5	0.5	0.0	1.0	0.0	0.1	0.5	2.6	0.3	0.362	0.3	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.1	0.204	0.1
Mackerel	0.0	0.5	0.2	0.1	0.1	0.0	0.1	0.2	1.2	0.2	0.160	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.000	0.0
Herring	0.3	19.5	1.5	18.5	34.0	27.5	21.5	8.0	130.8	16.4	12.099	12.9	1.0	0.0	15.0	133.0	15.5	10.0	174.5	29.1	51.342	42.1
Alewife	0.5	4.5	1.6	1.0	0.6	0.7	3.6	1.5	14.0	1.8	1.494	2.0	1.3	3.0	1.0	0.0	1.5	2.3	9.0	1.5	1.037	1.2
Cusk (Spotted)	0.0	0.1	1.2	0.0	0.0	0.0	0.0	0.0	1.3	0.2	0.419	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.000	0.0
Monkfish/Goosefish	2.5	2.5	1.2	2.3	1.3	3.1	2.6	1.8	17.3	2.2	0.667	2.3	3.0	2.0	6.0	5.0	3.5	3.3	22.8	3.8	1.453	4.3
Sculpin	0.1	0.1	0.1	4.5	4.2	3.3	1.7	0.1	14.1	1.8	1.959	0.9	1.0	0.0	5.5	3.3	4.3	0.0	14.0	2.3	2.333	3.2
Spiny Dog/Dogfish	0.0	0.1	0.3	0.0	0.0	0.0	0.0	0.0	0.4	0.1	0.107	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.000	0.0
Butterfish	1.6	3.4	1.6	1.4	2.5	2.3	4.5	0.5	17.8	2.2	1.258	2.3	1.5	2.0	1.3	1.5	1.0	1.4	8.7	1.4	0.332	1.3
Loligo Squid	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.000	0.0
Illex	0.3	1.3	1.9	0.3	0.9	0.2	1.1	1.1	7.1	0.9	0.591	1.0	1.0	7.5	0.0	0.0	0.0	2.5	11.0	1.8	2.944	0.6
Scallops	0.1	0.1	0.2	2.5	0.0	0.0	0.0	0.0	2.9	0.4	0.868	0.1	0.0	0.0	6.5	0.0	0.0	0.0	6.5	1.1	2.654	1.6
Lobster	4.5	0.9	0.0	4.8	4.1	6.8	4.4	1.7	27.2	3.4	2.297	3.0	0.0	0.0	6.0	9.5	5.0	0.0	20.5	3.4	4.030	5.0
Jonah Crab	0.0	0.2	0.2	0.3	0.1	0.0	0.0	0.0	0.8	0.1	0.120	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.000	0.0
Rock Crab	0.0	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.3	0.0	0.046	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.000	0.0
Total: All Species	63.1	154.4	270.4	146.9	118.8	122.7	103.3	87.4	1066.9	133.4	62.867	132.1	129.0	513.5	261.5	401.0	210.5	197.7	1713.2	285.5	144.038	260.1
Total: Regulated Species	11.2	30.6	70.8	5.3	8.8	8.5	16.1	19.0	170.3	21.3	21.538	25.7	15.8	63.0	3.0	6.0	5.5	30.8	124.0	20.7	23.131	11.0
Ratio Reg. Sp. To Total Sp.	0.177	0.198	0.262	0.036	0.074	0.069	0.156	0.217	0.160	0.160	0.081	0.195	0.122	0.123	0.011	0.015	0.026	0.156	0.072	0.072	0.065	0.042

Table 3B. Catch in Numbers per Tow by Species for 30" raised footrope with 10" roller frame (F/V North Star) vs control net with footrope down on 10" roller frame (F/V Tenacious). Both nets have 50 mm bar space grates and 2.6" diamond mesh cod ends.

	Tenacious	Tenacious	Tenacious	Tenacious	Tenacious	Tenacious	Tenacious	Tenacious	Tenacious	Tenacious	Tenacious		North Star	North Star	North Star	North Star	North Star	North Star	North Star	North Star	North Star	North Star
	Contr. 1	Contr. 2	Contr. 3	Contr. 4	Contr. 5	Contr. 6	Contr. 7	Contr. 8					Exper. 1	Exper. 2	Exper. 3	Exper. 4	Exper. 5	Exper. 6	Exper. 7	Exper. 8		
Species	Tot. Num.	Tot. Num.	Tot. Num.	Tot. Num.	Tot. Num.	Tot. Num.	Tot. Num.	Tot. Num.	Sum	Num./Tow	Std.Dev.		Total Number	Total Number	Total Number	Total Number	Total Number	Total Number	Total Number	Total Number	Sum	Num./Tow
Shrimp	0	0	0			0	0	0	0	0	0.000	0	0	0	0	0	0	0	0	0	0	0.000
Whiting/Silver Hake	75	146	99			161	141	137	759	127	32.556	100	0	70	86	33	25	314	52	38.929		
EXP Whiting	190	652	1355			608	371	329	3504	584	415.851	686	0	2218	2580	1705	750	7939	1323	852.906		
Red Hake (Ling)	79	0	0			30	0	0	109	18	32.127	47	0	124	141	99	308	719	120	105.802		
White Hake	2	0	613			17	17	21	670	112	245.550	7	0	0	0	10	22	39	7	8.712		
Redfish	0	0	0			0	0	0	0	0	0.000	0	0	0	0	0	0	0	0	0.000		
American Plaice (Dab)	88	197	111			42	100	109	647	108	50.499	64	0	33	48	41	139	325	54	46.662		
Gray Sole (Witch Flounder)	34	102	4122			1	30	66	4355	726	1664.133	34	0	5	4	2	137	182	30	53.757		
Windowpane Flounder (Sand Dab)	0	0	0			0	0	0	0	0	0.000	0	0	0	0	0	0	0	0	0.000		
Winter Flounder (Blackback)	6	2	1			2	5	2	18	3	2.000	0	0	2	2	0	7	11	2	2.714		
Yellowtail Flounder	5	1	1			4	3	0	14	2	1.966	0	0	0	2	1	2	5	1	0.983		
Cod	1	0	0			0	0	0	1	0	0.408	0	0	0	0	0	0	0	0	0.000		
Haddock	7	0	0			0	0	0	7	1	2.858	24	0	0	0	0	0	24	4	9.798		
Pollock	0	0	0			0	0	0	0	0	0.000	0	0	0	0	0	0	0	0	0.000		
Gulf Stream Flounder	0	0	0			6	0	1	7	1	2.401	0	0	0	16	7	0	23	4	6.585		
Ocean Pout	0	1	1			0	1	0	3	1	0.548	0	0	0	0	0	1	1	0	0.408		
Mackerel	0	2	1			0	4	0	7	1	1.602	0	0	0	0	0	0	0	0	0.000		
Herring	6	0	0			0	0	0	6	1	2.449	7	0	155	59	160	83	464	77	69.515		
Alewife	6	0	0			0	0	0	6	1	2.449	13	0	11	0	14	18	56	9	7.581		
Cusk (Spotted)	0	1	1			0	0	2	4	1	0.816	0	0	0	0	0	0	0	0	0.000		
Monkfish/Goosefish	4	7	7			11	13	6	48	8	3.347	17	0	22	20	15	12	86	14	7.866		
Sculpin	1	1	0			17	0	0	19	3	6.795	0	0	26	15	27	0	68	11	13.110		
Spiny Dog/Dogfish	0	1	2			0	0	0	3	1	0.837	0	0	0	0	0	0	0	0	0.000		
Butterfish	31	0	17			30	52	5	135	23	19.191	17	0	11	26	12	15	81	14	8.503		
Loligo Squid	0	0	0			0	0	0	0	0	0.000	0	0	0	0	0	0	0	0	0.000		
Illex	5	0	0			0	0	0	5	1	2.041	4	0	0	0	0	20	24	4	8.000		
Scallops	3	2	0			0	0	0	5	1	1.329	0	0	9	0	0	0	9	2	3.674		
Lobster	21	3	0			0	16	0	40	7	9.374	0	0	0	0	0	0	0	0	0.000		
Jonah Crab	0	1	0			0	0	0	1	0	0.408	0	0	0	0	0	0	0	0	0.000		
Rock Crab	0	1	8			0	0	0	9	2	3.209	0	0	0	0	0	0	0	0	0.000		
Total: All Species	489	974	6239			768	612	541	9622	1604	2277.614	920	0	2616	2913	2093	1514	10056	1676	1094.851		
Total: Regulated Species	143	302	4848			66	155	198	5712	952	1910.006	129	0	40	56	54	307	586	98	110.733		

Table 4. Mean Catch (kg) Per Hour Tow by Species for Two Trials: 30" Dropper Chain with 10" Roller Frame vs Control Net with Footrope Down on 10" Roller Frame. Both with 50 mm Bar Space Grate and 2.6" Diamond Cod End. Paired Tows in Trial 2 Only.

	Trial 1		Trial 2	
	North Star	Tenacious	Tenacious	North Star
Dropper Chain Length	30	0	30	0
Roller Frame Diameter	10	10	10	10
Number of Tows	N = 4	N = 6	N = 9	N = 9
Shrimp	0.0	0.0	0.0	0.0
Whiting/Silver Hake	158.6	59.8	90.0	197.6
Red Hake (Ling)	28.1	20.4	23.0	24.0
White Hake	1.3	6.9	6.2	8.8
Redfish	0.0	0.0	0.0	0.0
American Plaice (Dab)	5.1	11.1	2.7	7.0
Gray Sole (Witch Flounder)	3.8	6.7	2.7	5.6
Windowpane Flounder (Sand Dab)	0.0	0.0	0.0	0.0
Winter Flounder (Blackback)	0.6	0.5	0.1	0.0
Yellowtail Flounder	0.2	0.4	0.2	0.0
Cod	0.0	0.0	0.0	0.0
Haddock	0.0	0.1	0.0	0.0
Pollock	0.0	0.0	0.0	0.0
Scallop	3.0	0.9	1.2	1.8
Ocean Pout	0.1	0.3	0.2	0.4
Mackerel	0.0	0.2	0.0	0.2
Herring	42.1	12.9	1.8	0.4
Alewife	1.2	2.0	0.8	0.8
Cusk (Spotted)	0.0	0.2	0.0	0.0
Monkfish/Goosefish	4.3	2.3	0.3	1.9
Sculpin	3.2	0.9	1.0	1.2
Spiny Dog/Dogfish	0.0	0.1	1.0	0.4
Butterfish	1.3	2.3	0.6	0.9
Loligo Squid	0.0	0.0	0.0	0.0
Illex	0.6	1.0	1.5	1.6
Octopus	1.6	0.1	0.0	0.0
Lobster	5.0	3.0	1.5	3.3
Jonah Crab	0.0	0.1	0.0	0.0
Rock Crab	0.0	0.0	0.0	0.0
All Species Total	260.1	132.1	134.6	256.0
Reg. Species Total	11.0	25.7	11.9	21.6
Percent Reg. Sp. Bycatch	4.226	19.495	8.849	8.426

Table 5. Catch in Weight and Number by Paired Tow for Selected Species for 30 Inch Raised Footrope with 10 Inch Roller Frame Net (F/V North Star) and for Control Net with Footrope Down on 10 Inch Frame (F/V Tenacious). Both Nets Have 50 mm Bar Space Grates and 2.6 Inch Diamond Mesh Cod Ends.

American Plaice Catch in Weight and Numbers between 30" Dropper Chains with Roller Frame and Control with Footrope on Frame

Both with 50 mm Grate and 2.6" Diamond Cod End

Tow Pair	Control Weight(kg)	30" D&Roller Weight(kg)	Control Number	30" D&Roller Number
1	7.6	8	88	64
2	15	0*	197	0*
3	22.5	22	111	200
4	2.7	2.75	0*	33
5	3.6	4	0*	48
6	3.9	3.25	42	41
7	9.1	0*	100	0*
8	9.5	11	109	139

* No Data. Bad tows, or weights only recorded.

Grey Sole Catch in Weight and Numbers between 30" Dropper Chains with Roller Frame and Control with Footrope on Frame
Both with 50 mm Grate and 2.6" Diamond Cod End

Tow Pair	Control Weight(kg)	30" D&Roller Weight(kg)	Control Number	30" D&Roller Number
1	1.3	3.5	34	34
2	8.5	0*	102	0*
3	22.9	31	252	319
4	0.3	0	0*	5
5	0.3	0.75	0*	4
6	0.1	0.5	1	2
7	2.3	0*	30	0*
8	5.5	14.25	66	137

* No Data. Bad tows, or weights only recorded.

Monkfish Catch in Weight and Numbers between 30" Dropper Chains with Roller Frame and Control with Footrope on Frame
Both with 50 mm Grate and 2.6" Diamond Cod End

Tow Pair	Control Weight(kg)	30" D&Roller Weight(kg)	Control Number	30" D&Roller Number
1	2.5	3	4	17
2	2.5	0*	7	0*
3	1.2	2	7	8
4	2.3	6	0*	22
5	1.3	5	0*	20
6	3.1	3.5	11	15
7	2.6	0*	13	0*
8	1.8	3.25	6	12

* No Data. Bad tows, or weights only recorded.

Red Hake Catch in Weight and Numbers between 30" Dropper Chains with Roller Frame and Control with Footrope on Frame

Both with 50 mm Grate and 2.6" Diamond Cod End

Tow Pair	Control Weight(kg)	30" D&Roller Weight(kg)	Control Number	30" D&Roller Number
1	20.5	21	79	47
2	27.5	0*	0	0*
3	38.5	51	0	0*
4	9.5	19.25	0*	124
5	5.3	24.5	0*	141
6	7.4	15	30	99
7	8	0*	0*	0*
8	22	57	0*	308

* No Data. Bad tows, or weights only recorded.

White Hake Catch in Weight and Numbers between 30" Dropper Chains with Roller Frame and Control with Footrope on Frame
Both with 50 mm Grate and 2.6" Diamond Cod End

Tow Pair	Control Weight(kg)	30" D&Roller Weight(kg)	Control Number	30" D&Roller Number
1	0.2	1.25	2	7
2	6.5	0*	0	0*
3	25	10	84	0
4	2	0	0*	0
5	3.8	0	0*	0
6	3	1.5	17	10
7	3.4	0*	17	0*
8	3.5	4	21	22

* No Data. Bad tows, or weights only recorded.

Silver Hake Catch in Weight and Numbers between 30" Dropper Chains with Roller Frame and Control with Footrope on Frame
Both with 50 mm Grate and 2.6" Diamond Cod End

Tow Pair	Control Weight(kg)	30" D&Roller Weight(kg)	Control Number	30" D&Roller Number
1	21.5	83.5	190	686
2	62.5	0*	652	0*
3	150.6	385	1355	0*
4	96.4	198	0*	2218
5	54.3	210	0*	2580
6	58.5	155	608	1705
7	39.5	0*	371	0*
8	30	90	329	750

* No Data. Bad tows, or weights only recorded.

Table 6A. Catch in Weight per Tow by Species for 30" raised footrope with 10" roller frame (F/V Tenacious) vs control net with footrope down on 10" roller frame (F/V North Star). Both nets have 50 mm bar space grates and 2.6" diamond mesh cod ends.

[illegible]

Table 6B. Catch in Numbers per Tow by Species for 30" raised footrope with 10" roller frame (F/V Tenacious) vs control net with footrope down on 10" roller frame (F/V North Star). Both nets have 50 mm bar space grates and 2.6" diamond mesh cod ends.

Species	North Star												North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star			North Star		
---------	------------	--	--	--	--	--	--	--	--	--	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--	------------	--	--

Table 7. Catch in Weight and Number by Paired Tow for Selected Species for 30 Inch Raised Footrope with 10 Inch Roller Frame Net (F/V Tenacious) and for Control Net with Footrope Down on 10 Inch Frame (F/V North Star). Both Nets Have 50 mm Bar Space Grates and 2.6 Inch Diamond Mesh Cod Ends.

American Plaice Catch in Weight and Numbers between 30" Dropper Chains with Roller Frame and Control with Footrope on Frame Both with 50 mm Grate and 2.6" Diamond Cod End.

Tow Pair	Control Weight(kg)	30" D&Roller Weight(kg)	Control Number	30" D&Roller Number
1	1.5	1.25	20	9
2	1.6	1.75	14	17
3	2.5	1.5	31	14
4	5	1.1	50	7
5	6.2	1.5	56	16
6	10.5	2.7	111	23
7	15	7.25	162	56
8	20	6.7	186	54
9	12	2.8	91	27

* No Data. Bad tows, or weights only recorded.

Grey Sole Catch in Weight and Numbers between 30" Dropper Chains with Roller Frame and Control with Footrope on Frame Both with 50 mm Grate and 2.6" Diamond Cod End.

Tow Pair	Control Weight(kg)	30" D&Roller Weight(kg)	Control Number	30" D&Roller Number
1	0.1	0.1	3	1
2	0.1	0.25	2	2
3	0.1	0.2	3	2
4	0.4	0.4	2	2
5	0.4	0.1	12	2
6	8	2.4	80	24
7	28	13	233	100
8	17	5.8	184	45
9	5.2	4.5	45	42

* No Data. Bad tows, or weights only recorded.

Monkfish Catch in Weight and Numbers between 30" Dropper Chains with Roller Frame and Control with Footrope on Frame Both with 50 mm Grate and 2.6" Diamond Cod End

Tow Pair	Control Weight(kg)	30" D&Roller Weight(kg)	Control Number	30" D&Roller Number
1	1.5	0	6	0
2	1.2	1.75	4	4
3	2	0.2	4	1
4	2.6	0.1	13	1
5	5.6	0.5	24	1
6	0.8	0.05	4	1
7	2	0.05	14	1
8	1.6	0	7	0
9	3.2	0	10	0

* No Data. Bad tows, or weights only recorded.

Red Hake Catch in Weight and Numbers between 30" Dropper Chains with Roller Frame and Control with Footrope on Frame Both with 50 mm Grate and 2.6" Diamond Cod End

Tow Pair	Control Weight(kg)	30" D&Roller Weight(kg)	Control Number	30" D&Roller Number
1	17	18.75	106	128
2	16	19.25	126	94
3	15	16	103	74
4	27	24.5	58	123
5	24	22	68	127
6	41	27.5	168	99
7	38.5	34.75	185	124
8	41	36.5	180	159
9	34	30	163	144

* No Data. Bad tows, or weights only recorded.

White Hake Catch in Weight and Numbers between 30" Dropper Chains with Roller Frame and Control with Footrope on Frame Both with 50 mm Grate and 2.6" Diamond Cod End

Tow Pair	Control Weight(kg)	30" D&Roller Weight(kg)	Control Number	30" D&Roller Number
1	10	5.25	59	32
2	8	8.25	55	39
3	7	4.6	50	28
4	5.2	3.3	26	18
5	5.8	6.5	35	35
6	13.5	9	35	22
7	10.5	3.4	55	11
8	22.5	14.5	172	53
9	10.5	7.5	29	18

* No Data. Bad tows, or weights only recorded.

Silver Hake Catch in Weight and Numbers between 30" Dropper Chains with Roller Frame and Control with Footrope on Frame Both with 50 mm Grate and 2.6" Diamond Cod End

Tow Pair	Control Weight(kg)	30" D&Roller Weight(kg)	Control Number	30" D&Roller Number
1	100	98.5	1054	1123
2	125	83.25	1115	866
3	150	69.5	1673	586
4	160	93.75	1506	919
5	160	86.5	1227	1211
6	250	96.75	2500	851
7	360	134	3857	1206
8	360	119	2845	1023
9	420	117	4773	1170

* No Data. Bad tows, or weights only recorded.

Table 8. Two Sets of Paired Tows 30" Raised Footrope with no Frame vs Control Footrope Down on Frame.

Both Nets with 50 mm Bar Space Grate and 2.6 Inch Diamond Mesh Cod End.

Test: 30" Raised Footrope w/ no Frame vs Control Footrope Down on Frame.

North Star = Experimental

Vessel	Date	Grate (in)	Cod End (in)	Dropper (in)	Roller Dia (in)	Tow	Begin Time	End Time	Beginning		End		Water Temp (°F)	Depth Haul (fm)	Tow Speed (kt)	Wire Out (fm)	Total Weight (kg)	Reg. Sp. Wt. (kg)	% Reg.Sp.
									Lat/Long Decimal degrees	Lat/Long Decimal degrees									
Tenacious	9/17/2001	2	2.6	0	10	9	7:05	7:50	43.505	69.933	43.479	69.944	0.0	63.5-64.5	2.4	175.0	167.1	41.9	25.1
Tenacious	9/17/2001	2	2.6	0	10	10	8:15	9:24	43.480	69.942	43.520	69.899	0.0	66	2.5	175.0	380.4	56.8	14.9
Tenacious	9/17/2001	2	2.6	0	10	11	10:20	10:56	43.512	69.917	43.501	69.940	64.5	63-62.5	2.5	175.0	211.4	25.0	11.8
Tenacious	9/17/2001	2	2.6	0	10	12	11:55	12:48	43.505	69.926	43.509	69.900	0.0	65-61	2.5	175.0	376.0	53.6	14.3
Tenacious	9/17/2001	2	2.6	0	10	13	13:28	14:41	43.501	69.903	43.468	69.958	66.3	64-67.5	2.5	175.0	291.6	57.6	19.8
Tenacious	9/18/2001	2	2.6	0	10	14	6:55	7:35	43.504	69.936	43.469	69.943	65.0	60-68	2.4	175.0	131.3	30.1	22.9
Tenacious	9/18/2001	2	2.6	0	10	15	8:21	9:25	43.468	69.956	43.513	69.937	65.0	63.2-67.5	2.5	175.0	212.2	55.9	26.3
Tenacious	9/18/2001	2	2.6	0	10	16	10:24	11:23	42.902	69.284	43.508	69.911	63.8	63	2.7	175.0	227.0	41.0	18.1
Tenacious	9/18/2001	2	2.6	0	10	17	11:51	12:52	43.500	69.917	43.476	69.965	65.8	65.1-68.6	2.5	175.0	177.0	46.5	26.3
												Tenacious	2	2.6	0	10	2173.9	408.4	18.8
															Mean	241.5	45.4	19.9	
															Median	212.2	46.5	19.8	
North Star	9/17/2001	2	2.6	30	0	9	7:04	0:00	43.500	69.927	43.556	69.929	0.0	60	2.4	175.0	*	*	*
North Star	9/17/2001	2	2.6	30	0	10	8:56	9:30	43.491	69.934	43.491	69.934	0.0	0	2.4	175.0	352*	53.5*	15.19*
North Star	9/17/2001	2	2.6	30	0	11	10:20	11:00	43.510	69.899	43.499	69.928	0.0	64-66	2.4	175.0	110.8	2.3	2.0
North Star	9/17/2001	2	2.6	30	0	12	11:52	12:50	43.495	69.922	43.511	69.890	0.0	62-64	2.5	175.0	197.3	6.5	3.3
North Star	9/17/2001	2	2.6	30	0	13	13:30	0:00	43.497	69.908	43.475	69.958	0.0	63-64	2.4	175.0	213.3	12.3	5.7
North Star	9/18/2001	2	2.6	30	0	14	6:50	7:51	43.503	69.919	43.468	69.938	0.0	63-67	2.4	175.0	78.6	0.6	0.8
North Star	9/18/2001	2	2.6	30	0	15	8:20	9:25	43.467	69.960	43.506	69.931	0.0	68-64	2.4	175.0	157.9	4.9	3.1
North Star	9/18/2001	2	2.6	30	0	16	10:15	11:23	43.506	69.927	43.500	69.908	0.0	64-65	2.5	175.0	128.7	3.2	2.4
North Star	9/18/2001	2	2.6	30	0	17	11:50	12:55	43.499	69.917	43.471	69.959	0.0	66-68	2.5	175.0	245.7	10.0	4.1
												North Star	2	2.6	30	0	1132.2	39.7	3.5
															Mean	161.7	5.7	3.1	
															Median	157.9	4.9	3.1	

* Net not rigged right, tow unacceptable, rerigged net.

Test: 30" Raised Footrope w/ no Frame vs Control Footrope Down on Frame.

Tenacious = Experimental

Vessel	Date	Grate (in)	Cod End (in)	Dropper (in)	Roller Dia (in)	Tow	Begin Time	End Time	Beginning		End		Water Temp (°F)	Depth Haul (fm)	Tow Speed (kt)	Wire Out (fm)	Total Weight (kg)	Reg. Sp. Wt. (kg)	% Reg.Sp.	
									Lat/Long	Decimal degrees	Lat/Long	Decimal degrees								
North Star	9/24/2001	2	2.6	0	10	27	7:20	8:15	43.603	69.891	43.619	69.859	0.0	46-36	2.4	125.0	215.8	2.2	1.0	
North Star	9/24/2001	2	2.6	0	10	28	8:49	9:35	43.609	69.860	43.580	69.884	0.0	42-47	2.4	125.0	128.0	12.6	9.9	
North Star	9/24/2001	2	2.6	0	10	29	10:05	11:05	43.583	69.884	43.618	69.864	0.0	48-46	2.4	125.0	267.4	7.6	2.9	
North Star	9/24/2001	2	2.6	0	10	30	11:19	12:03	43.609	69.860	43.591	69.898	0.0	46	2.5	125.0	142.4	9.2	6.5	
North Star	9/24/2001	2	2.6	0	10	31	12:28	13:40	43.597	69.890	43.590	69.875	0.0	47-42	2.4	125.0	60.8	11.5	18.8	
North Star	10/2/2001	2	2.6	0	10	32	7:29	8:40	43.599	69.911	43.605	69.861	0.0	43	2.4	125.0	215.9	8.5	3.9	
North Star	10/2/2001	2	2.6	0	10	33	8:54	10:14	43.605	69.865	43.616	69.873	0.0	43	2.4	125.0	186.9	8.0	4.3	
North Star	10/2/2001	2	2.6	0	10	34	10:34	11:46	43.620	69.872	43.583	69.892	0.0	46	2.4	125.0	177.0	8.9	5.0	
North Star	10/2/2001	2	2.6	0	10	35	12:01	13:05	43.584	69.890	43.623	69.868	0.0	46	2.4	125.0	233.3	4.6	2.0	
North Star	10/2/2001	2	2.6	0	10	36	13:20	14:16	43.621	69.869	43.601	69.909	0.0	39	2.4	125.0	146.2	7.2	4.9	
													North Star	2	2.6	0	10	1557.9	78.1	5.0
																Mean	173.1	8.7	6.5	
																Median	177.0	8.5	4.9	
Tenacious	9/24/2001	2	2.6	30	0	27	7:22	8:16	43.602	69.890	43.623	69.854	64.5	46-34	2.4	125.0	25.0	0.7	2.8	
Tenacious	9/24/2001	2	2.6	30	0	28	8:45	9:26	43.605	69.855	43.576	69.875	62.9-64.2	0	2.7	125.0	69.8	5.4	7.7	
Tenacious	9/24/2001	2	2.6	30	0	29	10:00	10:56	43.584	69.876	43.617	69.868	64.2-63.5	46-36	2.5	125.0	155.8	2.7	1.7	
Tenacious	9/24/2001	2	2.6	30	0	30	11:22	12:03	43.608	69.859	43.590	69.891	64.2-64.4	40-47	2.5	125.0	49.2	0.8	1.6	
Tenacious	9/24/2001	2	2.6	30	0	31	12:30	13:40	43.602	69.885	43.589	69.868	64.5-64.4	46-47	2.5	125.0	121.3	4.3	3.5	
Tenacious	10/2/2001	2	2.6	30	0	32	7:36	8:38	43.602	69.907	43.607	69.859	61.8-61.5	48-46	2.5	150.0	116.3	5.1	4.4	
Tenacious	10/2/2001	2	2.6	30	0	33	9:04	10:10	43.592	69.854	43.620	69.873	0.0	48-41	2.5	150.0	111.1	3.7	3.3	
Tenacious	10/2/2001	2	2.6	30	0	34	10:38	11:44	43.609	69.854	43.582	69.892	61.7-60.6	42-48.5	2.7	150.0	84.8	0.7	0.9	
Tenacious	10/2/2001	2	2.6	30	0	35	12:05	13:05	43.576	69.875	43.617	69.857	61.7	48	2.7	150.0	77.5	0.8	1.1	
Tenacious	10/2/2001	2	2.6	30	0	36	13:26	14:14	43.617	69.857	43.601	69.908	62.7-62.6	40-48	2.7	150.0	29.1	0.2	0.7	
													Tenacious	2	2.6	30	0	814.7	23.6	2.9
																Mean	90.5	2.6	2.8	
																Median	84.8	2.7	1.7	

Tenacious Tenacious Tenacious Tenacious Tenacious Tenacious Tenacious Tenacious Tenacious Tenacious

[illegible]

Table 10. Mean Catch (kg) Per Hour Tow by Species for Two Trials: 30" Dropper Chain with No Roller Frame vs Control Net with Footrope Down on 10" Roller Frame. Both with 50 mm Bar Space Grate and 2.6" Diamond Cod End. Paired Tows.

	Trial 1		Trial 2	
	North Star	Tenacious	Tenacious	North Star
Dropper Chain Length	30	0	30	0
Roller Frame Diameter	0	10	0	10
Number of Tows	N = 7	N = 7	N = 10	N = 10
Shrimp	0.0	0.0	0.0	0.0
Whiting/Silver Hake	139.6	122.1	70.8	122.5
Red Hake (Ling)	6.8	27.9	2.6	13.9
White Hake	3.6	6.9	1.6	4.4
Redfish	0.0	0.0	0.0	0.0
American Plaice (Dab)	1.2	9.6	0.7	3.0
Gray Sole (Witch Flounder)	0.8	20.0	0.0	0.0
Windowpane Flounder (Sand Dab)	0.0	0.0	0.0	0.0
Winter Flounder (Blackback)	0.0	0.0	0.1	0.3
Yellowtail Flounder	0.0	0.0	0.1	0.1
Cod	0.0	0.6	0.0	0.0
Haddock	0.1	0.0	0.1	0.0
Pollock	0.0	0.0	0.0	0.0
Scallop	0.0	0.1	0.3	3.8
Ocean Pout	0.0	0.1	0.0	0.1
Mackeral	0.0	0.1	0.1	0.2
Herring	1.7	0.2	8.2	6.3
Alewife	7.2	3.2	0.2	0.3
Cusk (Spotted)	0.0	0.0	0.0	0.0
Monkfish/Goosefish	0.2	1.7	0.2	2.5
Sculpin	0.0	0.0	0.6	3.4
Spiny Dog/Dogfish	0.0	0.0	0.0	0.0
Butterfish	0.6	0.4	0.3	0.1
Loligo Squid	0.0	0.0	0.0	0.0
Illex	1.1	2.1	1.0	0.7
Octopus	0.0	0.0	0.0	0.0
Lobster	0.0	0.0	2.5	9.6
Jonah Crab	0.0	0.0	0.0	0.4
Rock Crab	0.0	0.0	0.1	0.0
All Species Total	162.9	195.2	89.3	171.6
Reg. Species Total	5.7	37.2	2.6	7.8
Percent Reg. Sp. Bycatch	3.5	19.0	2.9	4.5

Table 11. Catch in Weight and Number by Paired Tow for Selected Species for 30 Inch Raised Footrope with No Roller Frame Net (F/V North Star) and for Control Net with Footrope Down on 10 Inch Frame (F/V Tenacious). Both Nets Have 50 mm Bar Space Grates and 2.6 Inch Diamond Mesh Cod Ends.

American Plaice Catch in Weight and Numbers between 30" Dropper Chains with No Roller Frame and Control with Footrope on Frame Both with 50 mm Grate and 2.6" Diamond Cod End

Tow Pair	Control Weight(kg)	30" D&NoRoller Weight(kg)	Control Number	30" D&NoRoller Number
1	12	0*	131	0*
2	13.2	7.25	132	68
3	9.6	1	98	13
4	15.6	1.25	164	10
5	11.2	2.75	128	25
6	6.5	0.1	81	3
7	14.25	0.5	214	7
8	10.75	0.15	134	4
9	12.25	2.5	128	27

* No Data. Bad tows, or weights only recorded.

Red Hake Catch in Weight and Numbers between 30" Dropper Chains with No Roller Frame and Control with Footrope on Frame Both with 50 mm Grate and 2.6" Diamond Cod End

Tow Pair	Control Weight(kg)	30" D&Roller Weight(kg)	Control Number	30" D&Roller Number
1	27.5	0*	0	0
2	48	30	208	186
3	17.2	0	70	0
4	31.2	10.25	116	43
5	26	8.25	92	26
6	26.5	2.5	90	10
7	38.75	5	0	21
8	61	6	183	27
9	32	15	165	42

* No Data. Bad tows, or weights only recorded.

Grey Sole Catch in Weight and Numbers between 30" Dropper Chains with No Roller Frame and Control with Footrope on Frame Both with 50 mm Grate and 2.6" Diamond Cod End

Tow Pair	Control Weight(kg)	30" D&NoRoller Weight(kg)	Control Number	30" D&Roller Number
1	20	0*	187	0*
2	15.2	33	144	330
3	11.4	1.25	104	6
4	15.6	0.5	156	16
5	38	2.25	344	19
6	14.5	0	130	0
7	41.5	0.4	525	4
8	16	0	160	0
9	29.5	1.5	283	12

* No Data. Bad tows, or weights only recorded.

White Hake Catch in Weight and Numbers between 30" Dropper Chains with No Roller Frame and Control with Footrope on Frame Both with 50 mm Grate and 2.6" Diamond Cod End

Tow Pair	Control Weight(kg)	30" D&Roller Weight(kg)	Control Number	30" D&Roller Number
1	8.7	0	22	0
2	28	13.25	92	34
3	4	0	14	0
4	17.6	4.75	68	13
5	8	7.25	20	18
6	9	0.5	0	2
7	0	3.5	0	9
8	14	3	42	13
9	4.75	6	15	18

* No Data. Bad tows, or weights only recorded.

Monkfish Catch in Weight and Numbers between 30" Dropper Chains with No Roller Frame and Control with Footrope on Frame Both with 50 mm Grate and 2.6" Diamond Cod End

Tow Pair	Control Weight(kg)	30" D&Roller Weight(kg)	Control Number	30" D&Roller Number
1	1.8	0	8	0
2	0.4	2.5	8	9
3	2.4	0.5	6	3
4	4	0.25	16	1
5	0.4	0	4	0
6	0.7	0	3	0
7	1.75	0	0	0
8	2.25	0	9	0
	2.25	0.4	16	1

* No Data. Bad tows, or weights only recorded.

Silver Hake Catch in Weight and Numbers between 30" Dropper Chains with No Roller Frame and Control with Footrope on Frame Both with 50 mm Grate and 2.6" Diamond Cod End

Tow Pair	Control Weight(kg)	30" D&Roller Weight(kg)	Control Number	30" D&Roller Number
1	88	0	789	0
2	270	260	2430	3207
3	163	100	1545	1300
4	272	165	2840	0
5	194	190	1765	1368
6	67.5	60	544	450
7	110.5	130	1157	910
8	119.5	115	1297	989
9	91	210	910	1638

* No Data. Bad tows, or weights only recorded.

[illegible]

Table 12B. Catch in Numbers per Tow by Species for 30" raised footrope with no roller frame (F/V Tenacious) vs control net with footrope down on 10" roller frame (F/V North Star). Both nets have 50 mm bar space grades and 2.6" diamond mesh cod ends.																														
North Star North Star North Star North Star North Star North Star North Star North Star North Star North Star North Star North Star North Star North Star North Star															Tenacious	Tenacious	Tenacious	Tenacious	Tenacious	Tenacious	Tenacious	Tenacious	Tenacious	Tenacious	Tenacious	Tenacious	Tenacious	Tenacious	Tenacious	
Con: 27 Con: 28 Con: 29 Con: 30 Con: 31 Con: 32 Con: 33 Con: 34 Con: 35 Con: 36															Exper: 27	Exper: 28	Exper: 29	Exper: 30	Exper: 31	Exper: 32	Exper: 33	Exper: 34	Exper: 35	Exper: 36						
Species	Tot.Num.	Tot.Num.	Tot.Num.	Tot.Num.	Tot.Num.	Tot.Num.	Tot.Num.	Tot.Num.	Tot.Num.	Tot.Num.	Tot.Num.	Sum	Num./Tow	Std.Dev.	Tot.Num.	Tot.Num.	Tot.Num.	Tot.Num.	Tot.Num.	Tot.Num.	Tot.Num.	Tot.Num.	Tot.Num.	Sum	Num./Tow	Std.Dev.				
Shrimp	0	0	0	0	0	0	0	0	0	0	0	0	0.000		0	0	0	0	0	0	0	0	0	0	0	0.000				
Whiting/Silver Hake	45	44	37	39	64	55	75	72	62	493	55	14,228		0.01	56	49	55	57	64	55	52	81	585	50	8.947					
EXP Whiting	1500	737	1741	965	2074	1473	1694	2667	1152	14043	1560	582,842		189	554	956	460	24	1165	1108	1267	769	763	383	7581	758	362,694			
Red Hake (Ling)	140	49	143	80	53	76	34	69	75	39	449		3	31	20	4	21	30	12	8	5	1	140	14	11,333					
White Hake	23	38	21	18	26	21	27	15	15	204	23	7,159		0	17	10	4	24	22	9	2	3	0	88	9	8,496				
Redfish	0	0	0	0	0	0	0	0	0	0	1	0	0.333		0	0	0	0	0	0	0	0	0	0	0	0.000				
American Plaice (Dab)	20	69	29	27	31	36	46	26	28	312	35	14,801		1	9	11	1	7	11	11	8	5	1	65	7	4,249				
Gray Sole (Witch Flounder)	0	2	2	3	0	1	0	2	3	13	1	1,236		0	0	1	0	0	4	2	1	1	0	9	1	1,267				
Windowpane Flounder (Sand Dab)	0	0	0	0	0	0	0	0	0	0	0	0.000		0	0	0	0	0	0	0	0	0	0	0	0	0.000				
Winter Flounder (Blackback)	1	0	1	1	0	5	0	0	3	11	1	1,716		1	0	0	0	0	1	0	0	0	0	0	2	0	0.422			
Yellowtail Flounder	0	0	1	0	1	1	1	1	0	4	0	0.527		0	0	1	0	1	0	0	0	0	0	0	2	0	0.422			
Cod	0	0	0	0	0	0	0	0	0	0	0	0.000		0	0	0	0	0	0	0	0	0	0	0	0	0.000				
Haddock	0	0	0	0	0	0	0	0	0	0	0	0.000		0	1	0	0	0	0	0	0	0	0	1	0	0.316				
Pollock	0	0	0	0	0	3	0	0	0	3	0	1,000		0	1	0	1	0	0	0	0	0	0	2	0	0.422				
Gulf Stream Flounder	0	5	6	8	4	5	7	7	10	52	819		0	0	6	1	2	1	6	1	1	0	7	1	0.675					
Scallop	1	1	1	0	1	0	0	1	1	6	1	0,500		0	0	0	0	1	2	0	1	0	0	4	0	0.699				
Shad	2	5	5	3	0	0	0	0	0	15	2	2,179		1	1	0	1	0	1	0	0	0	0	4	0	0.516				
Herring	33	263	148	43	0	0	13	20	4	523	58	89,340		87	79	460	24	4	0	1	26	28	11	720	72	139,741				
Alewife	2	1	6	2	2	5	9	12	12	51	6	4,387		1	0	4	1	0	0	5	12	3	3	29	3	3,665				
Cusk (Spotted)	0	0	0	0	0	0	0	0	0	0	0	0.000		0	0	0	0	0	0	0	0	0	0	0	0	0.000				
Monkfish/Goosefish	8	6	21	5	13	13	12	7	23	108	12	6,423		0	1	4	0	0	3	0	0	0	0	8	1	1,476				
Sculpin	11	5	14	9	22	8	14	17	14	114	13	5,099		0	2	3	0	4	9	3	3	1	0	25	3	2,718				
Spiny Dog/Dogfish	0	0	0	0	0	0	0	0	0	0	0	0.000		0	0	0	0	0	0	2	2	0	0	4	0	0.843				
EXP Dogfish	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0.000				
Butterfish	3	2	1	4	3	3	3	11	0	30	3	3,122		0	3	7	1	5	5	11	4	10	2	48	5	3,645				
Loligo Squid	0	0	0	0	0	0	0	0	0	0	0	0.000		0	0	0	0	0	0	0	0	0	0	0	0	0.000				
Illex	13	1	1	9	3	10	3	9	5	5	5	4,717		8	6	12	6	5	8	16	14	17	6	96	10	4,695				
Octopus	0	0	0	0	0	0	0	0	0	0	0	0.000		0	0	0	0	0	0	0	0	0	0	0	0	0.000				
LOBSTER	0	0	0	0	0	0	0	0	0	0	0	0.000		0	0	0	0	0	0	0	0	0	0	0	0	0.000				
Jonah Crab	0	0	7	0	0	0	0	0	0	7	1	2,333		0	0	0	0	0	0	0	0	0	0	0	0	0.000				
Rock Crab	0	0	0	0	0	0	0	0	0	0	0	0.000		0	0	0	0	0	0	0	0	0	0	0	0	0.000				
All Species Total	1757	1184	1905	1117	2246	1640	1902	2829	1354	15934	1770	541,142		288	706	1489	487	1229	1203	1340	851	837	407	8936	884	417,617				
Req. Species Total	44	110	54	49	58	67	74	43	49	548	61	21,129		2	28	23	6	29	38	22	11	9	1	169	17	12,776				

Table 13. Catch in Weight and Number by Paired Tow for Selected Species for 30 Inch Raised Footrope with No Roller Frame Net (F/V Tenacious) and for Control Net with Footrope Down on 10 Inch Frame (F/V North Star). Both Nets Have 50 mm Bar Space Grates and 2.6 Inch Diamond Mesh Cod Ends.

American Plaice Catch in Weight and Numbers between 30" Dropper Chains with No Roller Frame and Control with Footrope on Frame Both with 50 mm Grate and 2.6" Diamond Cod End

Tow Pair	Control Weight(kg)	30" D&NoRoller Weight(kg)	Control Number	30" D&NoRoller Number
1	0.6	0.2	40	2
2	5.6	0.8	138	18
3	2.5	0.6	58	22
4	2	0.05	54	2
5	4	0.8	80	14
6	3.8	1	62	22
7	3.2	2	72	22
8	4.2	0.5	92	16
9	2	0.3	52	10
10	2.6	0.2	56	2

* No Data. Bad tows, or weights only recorded.

Red Hake Catch in Weight and Numbers between 30" Dropper Chains with No Roller Frame and Control with Footrope on Frame Both with 50 mm Grate and 2.6" Diamond Cod End

Tow Pair	Control Weight(kg)	30" D&Roller Weight(kg)	Control Number	30" D&Roller Number
1	28	0.4	140	3
2	15	5	49	31
3	23.75	3.5	143	20
4	14	1.1	80	6
5	16.75	4.3	84	24
6	10.5	4.8	59	30
7	10.5	2.6	63	12
8	11.5	1.7	76	8
9	5	0.7	35	5
10	9	0.1	44	1

* No Data. Bad tows, or weights only recorded.

Grey Sole Catch in Weight and Numbers between 30" Dropper Chains with No Roller Frame and Control with Footrope on Frame Both with 50 mm Grate and 2.6" Diamond Cod End

Tow Pair	Control Weight(kg)	30" D&NoRoller Weight(kg)	Control Number	30" D&Roller Number
1	0	0	0	0
2	0.01	0	2	0
3	0.02	0.05	2	1
4	0.02	0	3	0
5	0	0	0	0
6	0	0	0	4
7	0.075	0.01	1	2
8	0.05	0	0	1
9	0.025	0.1	2	1
10	0.1	0	3	0

* No Data. Bad tows, or weights only recorded.

White Hake Catch in Weight and Numbers between 30" Dropper Chains with No Roller Frame and Control with Footrope on Frame Both with 50 mm Grate and 2.6" Diamond Cod End

Tow Pair	Control Weight(kg)	30" D&Roller Weight(kg)	Control Number	30" D&Roller Number
1	1.6	0	23	0
2	7	3.5	38	17
3	5	1.8	21	10
4	7	0.7	42	4
5	7.25	3.2	44	21
6	4.5	3.8	26	22
7	4	1.6	21	9
8	4.5	0.2	27	2
9	2.5	0.5	15	3
10	2.5	0	15	0

* No Data. Bad tows, or weights only recorded.

Monkfish Catch in Weight and Numbers between 30" Dropper Chains with No Roller Frame and Control with Footrope on Frame Both with 50 mm Grate and 2.6" Diamond Cod End

Tow Pair	Control Weight(kg)	30" D&Roller Weight(kg)	Control Number	30" D&Roller Number
1	1.8	0	8	0
2	1.3	0.1	6	1
3	5.25	1	21	4
4	1.2	0	5	0
5	0.5	0	18	0
6	3.4	0.6	13	3
7	3	0	13	0
8	1.8	0	12	0
9	1.2	0	7	0
10	6.5	0	23	0

* No Data. Bad tows, or weights only recorded.

Silver Hake Catch in Weight and Numbers between 30" Dropper Chains with No Roller Frame and Control with Footrope on Frame Both with 50 mm Grate and 2.6" Diamond Cod End

Tow Pair	Control Weight(kg)	30" D&Roller Weight(kg)	Control Number	30" D&Roller Number
1	140	15.5	1500	189
2	67	49.5	737	554
3	200	97.5	5227	956
4	94	40	965	440
5	0*	105	0*	1155
6	175	97	2074	1106
7	150	99	1473	1267
8	140	69.9	1694	769
9	200	66	2667	763
10	100	26	1192	383

* No Data. Bad tows, or weights only recorded.

Table 14. Tow Information for Comparison of Square Mesh and Diamond Mesh Cod Ends in Conjunction with Raised Footrope with and without a Roller Frame, or with Footrope Down on Roller Frame Net Configurations.

Vessel	Date	Grate (in)	Cod End (in)	Dropper (in)	Roller Dia (in)	Tow	Begin Time	End Time	Begin Lat/Long	End Lat/Long	Water Temp (°F)	Depth Haul (fm)	Tow Speed (kt)	Wire Out (fm)
North Star	10/5/2001	2	2.2	0	10	41	7:33	8:38	43.59769,69.90841	43.60049,69.85754	0.0	41	2.4	125.0
North Star	10/5/2001	2	2.2	0	10	42	8:53	10:00	43.60071,69.85712	43.59974,69.90740	0.0	45	2.4	125.0
Tenacious	10/3/2001	2	2.2	30	0	37	7:44	8:43	43.28.45,69.58.05	43.30.19,69.55.70	61.7-61.7	66.7-65.1	2.4	175.0
Tenacious	10/3/2001	2	2.2	30	0	38	9:53	10:49	43.35.32,69.52.95	43.37.47,69.52.08	61.3-61.7	48-38	2.4	150.0
North Star	10/3/2001	2	2.2	30	10	39	11:38	12:46	43.62656,69.87020	43.60160,69.84519	0.0	27	2.4	125.0
North Star	10/3/2001	2	2.2	30	10	40	13:03	14:12	43.59992,69.84575	43.60541,69.90199	0.0	44	2.4	125.0
Tenacious	10/5/2001	2	2.2	30	10	43	10:47	11:47	43.36.09,69.53.28	43.35.60,69.50.78	63.6-63.8	46-48.5	2.3	125.0
Tenacious	10/5/2001	2	2.2	30	10	44	12:10	13:14	43.35.29,69.50.20	43.36.01,69.54.10	63.5-63.6	49-48.5	2.5	125.0

North Star	10/5/2001	2	2.6	0	10	43	10:42	11:47	43.60689,69.90227	43.59377,69.84792	0.0	48	2.4	125.0
North Star	10/5/2001	2	2.6	0	10	44	12:11	13:17	43.59684,69.84872	43.60176,69.90220	0.0	48	2.4	125.0
Tenacious	10/3/2001	2	2.6	30	0	39	11:43	12:46	43.37.13,69.51.40	43.36.18,69.50.73	61.5-61.5	39-46.5	2.4	150.0
Tenacious	10/3/2001	2	2.6	30	0	40	13:08	14:09	43.35.42,69.50.32	43.36.12,69.54.21	62.2-61.8	49-48.5	2.5	125.0
North Star	10/3/2001	2	2.6	30	10	37	7:36	8:46	43.46967,69.97322	43.50321,69.92761	0.0	65	2.4	175.0
North Star	10/3/2001	2	2.6	30	10	38	9:43	10:49	43.58435,69.88604	43.62468,69.86705	0.0	46	2.4	125.0
Tenacious	10/5/2001	2	2.6	30	10	41	7:40	8:37	43.54.23,69.54.23	43.36.20,69.51.52	63.8-64	47.5-47	2.3	125.0
Tenacious	10/5/2001	2	2.6	30	10	42	8:58	10:00	43.35.51,69.51.02	43.36.09,69.54.26	63.5-63.5	47-48	2.4	125.0

Vessel	Date	Grate (in)	Cod End (in)	Dropper (in)	Roller Dia (in)	Tow	Total Weight (kg)	Reg. Sp. W (kg)	% Reg.Sp.	Total Number	No. Reg.Sp	% Reg.Sp.
North Star	10/5/2001	2	2.2	0	10	41	115.8	15.3	13.2	548	132	24.1
North Star	10/5/2001	2	2.2	0	10	42	106.9	10.7	10.0	1302	85	6.5
Tenacious	10/3/2001	2	2.2	30	0	37	69.7	16.6	23.8	528	80	15.2
Tenacious	10/3/2001	2	2.2	30	0	38	132.8	6.3	4.7	1618	70	4.3
North Star	10/3/2001	2	2.2	30	10	39	151.7	4.2	2.8	1239	53	4.3
North Star	10/3/2001	2	2.2	30	10	40	146.1	7.4	5.1	1236	69	5.6
Tenacious	10/5/2001	2	2.2	30	10	43	69.4	7.3	10.5	671	64	9.5
Tenacious	10/5/2001	2	2.2	30	10	44	61.0	3.4	5.6	630	31	4.9

Sum	853.3	71.1	9.5	Mean %	7772	584	9.3
Mean	106.7	8.9	8.3	% of Means	971	73	7.5

North Star	10/5/2001	2	2.6	0	10	43	198.8	17.4	8.8	2566	141	5.5
North Star	10/5/2001	2	2.6	0	10	44	96.8	5.6	5.8	1316	52	4.0
Tenacious	10/3/2001	2	2.6	30	0	39	107.8	3.2	3.0	1444	42	2.9
Tenacious	10/3/2001	2	2.6	30	0	40	83.1	1.2	1.4	1118	21	1.9
North Star	10/3/2001	2	2.6	30	10	37	100.4	33.8	33.7	514	234	45.6
North Star	10/3/2001	2	2.6	30	10	38	186.2	7.9	4.2	1938	71	3.7
Tenacious	10/5/2001	2	2.6	30	10	41	147.2	11.2	7.6	1610	104	6.5
Tenacious	10/5/2001	2	2.6	30	10	42	110.8	5.3	4.8	1196	44	3.7

Sum	1031.1	85.6	8.7	Mean %	11701	710	9.2
Mean	128.9	10.7	8.3	% of Means	1463	89	6.1

Table 15. F/V North Star Tows with Bottom Friendly net, 50 mm Grate and 2.6" Diamond Mesh Cod End, October, November, 2001.

Date	Tow #	Tot.Catch	Whiting	Reg Sp	RegSp% Tot Cat	Tow Time	Depth (F)	Tow Time DecHrs	Tot.Cat/Hr	Reg.Sp/Hr	%Reg.Sp
10/9/2001	1	186.0	140	5.4	2.9	1:20	55-64	1.33	139.5	4.1	2.9
10/9/2001	2	216.0	190	3.3	1.5	1:35	61-63	1.58	136.4	2.1	1.5
10/9/2001	3	236.9	200	4.2	1.8	1:42	63-60	1.70	139.4	2.4	1.8
10/11/2001	4	0.0	0	0.0	0.0	1:00	58-62	1.00			
10/11/2001	5	19.9	19	0.0	0.0	1:30	65-70	1.50			
10/11/2001	6	162.7	100	6.5	4.0	1:30	68-59	1.50			
10/11/2001	7	106.1	65	9.2	8.7	1:20	60-51	1.33	79.6	6.9	8.7
10/12/2001	8	64.0	35	2.4	3.8	2:00	60-68	2.00	32.0	1.2	3.8
10/12/2001	9	54.6	40	1.1	2.0	1:22	68.00	1.37	40.0	0.8	2.0
10/12/2001	10	48.2	36	0.8	1.7	1:20	71-74	1.33	36.2	0.6	1.7
10/12/2001	11	91.6	64	3.7	4.0	1:30	64-58	1.50	61.1	2.5	4.0
10/16/2001	12	176.0	140	6.0	3.4	1:55	64-61	1.92	91.8	3.1	3.4
10/16/2001	13	216.0	175	5.0	2.3	1:27	62-63	1.45	149.0	3.4	2.3
10/16/2001	14	139.3	115	3.5	2.5	1:04	63-68	1.07	130.5	3.3	2.5
10/16/2001	15	113.4	85	2.7	2.3	1:45	66-58	1.75	64.8	1.5	2.3
10/19/2001	16	262.5	210	4.8	1.8	2:00	51-68	2.00	131.2	2.4	1.8
10/19/2001	17	221.1	183	3.3	1.5	2:00	68-59	2.00	110.6	1.6	1.5
10/19/2001	18	0.0	0	0.0	0.0	1:15	59-62	1.25			
10/20/2001	19	223.8	175	4.3	1.9	1:30	63-64	1.50	149.2	2.8	1.9
10/20/2001	20	158.1	135	3.3	2.1	1:33	64-70	1.55	102.0	2.1	2.1
10/20/2001	21	128.6	100	3.4	2.6	1:47	72-64	1.78	72.1	1.9	2.6
10/22/2001	22	128.2	120	2.5	2.0	1:30	59-63	1.50	85.5	1.7	2.0
10/22/2001	23	95.5	85	2.8	2.9	1:28	63-62	1.47	65.1	1.9	2.9
10/22/2001	24	235.3	200	6.8	2.9	1:27	62-61	1.45	162.2	4.7	2.9
10/22/2001	25	69.8	60	2.4	3.4	1:35	64-57	1.58	44.1	1.5	3.4
10/23/2001	26	67.1	60	1.2	1.7	1:43	63-66	1.73	38.7	0.7	1.7
10/23/2001	27	90.6	80	2.8	3.1	1:30	63-64	1.50	60.4	1.9	3.1
10/23/2001	28	82.0	72	2.1	2.6	1:53	63-65	1.88	43.5	1.1	2.6
10/28/2001	29	32.8	13	0.1	0.3	0:23	37-39	0.38	85.6	0.3	0.3
10/28/2001	30	30.7	25	0.8	2.6	0:36	48-55	0.60	51.2	1.3	2.6
10/28/2001	31	103.4	65	3.3	3.1	1:30	65-70	1.50	68.9	2.2	3.1
10/28/2001	32	81.4	72	0.5	0.7	1:25	58-56	1.42	57.5	0.4	0.6
10/29/2001	33	71.6	62	2.1	2.9	1:21	58-63	1.35	53.0	1.5	2.9
10/29/2001	34	96.4	80	0.9	0.9	1:17	66-67	1.28	75.1	0.7	0.9
10/29/2001	35	84.0	70	2.0	2.4	1:25	73-72	1.42	59.3	1.4	2.4
10/29/2001	36	71.3	58	2.2	3.0	1:25	71-60	1.42	50.3	1.5	3.0
10/31/2001	37	96.1	85	3.3	3.4	1:15	62-64	1.25	76.9	2.6	3.4
10/31/2001	38	141.3	100	4.0	2.8	1:19	63-60	1.32	107.3	3.0	2.8
10/31/2001	39	116.0	72	2.8	2.4	1:28	63-60	1.47	79.1	1.9	2.4
10/31/2001	40	84.4	60	1.3	1.5	1:15	61-58	1.25	67.5	1.0	1.5
11/4/2001	41	176.6	144	4.2	2.4	2:00	67-64	2.00	88.3	2.1	2.4
11/4/2001	42	78.1	70	1.1	1.3	1:15	65-64	1.25			
11/4/2001	43	108.7	95	4.4	4.0	1:20	69-66	1.33	81.5	3.3	4.0
11/4/2001	44	108.7	100	0.7	0.6	1:15	67-63	1.25	87.0	0.5	0.6
11/8/2001	45	84.2	72	3.0	3.6	1:35	65-60	1.58	53.2	1.9	3.6
11/8/2001	46	102.1	90	3.8	3.7	1:30	64-59	1.50	68.0	2.5	3.7
11/8/2001	47	106.8	100	1.5	1.4	1:30	60-68	1.50	71.2	1.0	1.4
11/8/2001	48	31.4	30	0.0	0.0	1:35	68-66	1.58			
11/10/2001	49	123.9	100	2.5	2.0	1:15	59-68	1.25	99.1	2.0	2.0
11/10/2001	50	110.8	90	2.4	2.2	1:50	69-72	1.83	60.4	1.3	2.2
11/10/2001	51	77.6	68	1.3	1.7	1:40	68-60	1.67	46.5	0.8	1.7
11/11/2001	52	174.4	145	4.6	2.6	1:40	64-67	1.67	104.6	2.8	2.6
11/11/2001	53	127.7	108	2.3	1.8	1:40	68-60	1.67	76.6	1.4	1.8
11/11/2001	54	107.4	92	2.3	2.1	2:08	64-65	2.13	50.4	1.1	2.1
11/15/2001	55	167.2	144	6.2	3.7	1:20	69-62	1.33	125.4	4.7	3.7
11/15/2001	56	99.8	84	3.8	3.8	1:23	61-62	1.38	72.1	2.7	3.8
11/15/2001	57	270.8	210	12.0	4.4	1:35	64-65	1.58	171.0	7.6	4.4
11/15/2001	58	198.7	155	6.8	3.4	1:32	64-60	1.53	129.6	4.4	3.4
11/17/2001	59	126.3	105	2.8	2.2	1:35	65-63	1.58	79.8	1.8	2.2
11/17/2001	60	97.6	83	2.2	2.3	1:43	64-67	1.72	56.8	1.3	2.3
11/17/2001	61	98.5	85	3.3	3.3	1:33	67-62	1.55	63.5	2.1	3.3
11/21/2001	62	74.9	60	0.4	0.5	1:30	40-57	1.50	49.9	0.3	0.5
11/21/2001	63	118.2	95	2.7	2.2	1:24	68-70	1.40	84.4	1.9	2.2
11/21/2001	64	140.5	108	3.3	2.3	1:20	68-60	1.33	105.4	2.5	2.3
11/24/2001	65	175.8	150	3.4	1.9	1:29	64-66	1.48	118.5	2.3	1.9
11/24/2001	66	137.9	122	1.9	1.4	1:26	67-62	1.43	96.2	1.3	1.4
11/24/2001	67	113.8	93	2.9	2.6	1:13	63-67	1.22	93.5	2.4	2.5
11/24/2001	68	193.1	175	5.3	2.8	1:34	66-63	1.57	123.2	3.4	2.7
11/27/2001	69	234.5	185	7.4	3.2	1:33	67-64	1.55	151.3	4.8	3.2
11/27/2001	70	156.0	140	4.2	2.7	1:43	63-68	1.72	90.9	2.4	2.7
11/27/2001	71	143.4	118	3.4	2.4	1:46	67-61	1.77	81.2	1.9	2.4

Yellow = Tows with Problems, discounted.

Total	5575.7	142.2	%Reg.Sp.
Mean Kg/Hr	85.8	2.2	2.5
StdDev	34.39	1.40	1.18
Number of Tows	65		

**Table 16. Whiting Grate Raised Footrope Sweepless Trawl Trials: 50 mm Bar Spacing, 2-1/2 Inch Cod End Mesh
2002 Tow Data: F/V Tenacious.**

Date	Tow	Begin Time	End Time	Begin Lat	Begin Long	End Lat	End Long	Water Temp (oF)	Depth Haul Start (fm)	Depth Haul End (fm)	Tow Speed (kt)	Wire Out (fm)
9/9/2002	1	8:07	8:49	4335.541	6956.386	4334.461	6958.121	0	47.5	51.8	2.5	150
9/9/2002	2	9:22	10:31	4333.82	6958.852	4333.914	6958.442	0	53	53.5	2.4	150
9/9/2002	3	11:11	12:35	4330.72	6954.909	4331.219	6954.795	0	62.7	60.8	2.4	175
9/9/2002	4	13:07	14:27	4330.091	6954.681	4331.16	6954.685	0	66.4	61.3	2.4	175
9/10/2002	5	7:28	8:47	4331.03	6954.751	4328.866	6957.501	0	60	65	2.4	175
9/10/2002	6	9:20	10:32	4328.636	6958.054	4330.795	6955.453	0	66	62	2.4	175
9/10/2002	7	10:57	12:28	4330.317	6955.969	4327.914	6958.474	0	62.5	66.5	2.4	175
9/10/2002	8	12:55	14:15	4328.319	6958.669	4330.351	6955.836	0	68.5	65	2.4	175
9/10/2002	9	15:03	16:04	4331.123	6956.559	4334.016	6958.689	0	62	57.6	2.4	175
9/17/2002	10*	7:05	8:10	4335.917	6951.377	4336.179	6952.08	0	49.7	47	2.3	150
9/17/2002	11*	9:18	10:30	4331.189	6954.783	4328.865	6957.436	0	60.9	65.6	2.3	175
9/17/2002	12*	11:08	12:15	4328.48	6956.572	4330.623	6954.181	0	68.5	62	2.3	175
9/17/2002	13*	12:45	13:48	4331.422	6954.105	4328.272	6958.091	0	63	68.5	2.4	175
9/24/2002	16	8:00	9:37	4331.26	6954.637	4328.356	6957.842	0	59.5	68.4	2.3	175
9/24/2002	17	10:00	11:50	4328.386	6958.08	4331.476	6954.412	0	67.3	59.3	2.3	175
9/24/2002	18	12:45	14:01	4329.02	6954.022	4326.115	6956.419	0	72	78.4	2.3	200
9/25/2002	19	8:12	9:16	4320.455	7008.6	4318.387	7010.484	0	63.1	61.4	2.3	175
9/25/2002	20	9:40	0:00	4318.442	6910.482	4320.84	7009.231	0	62.6	63	2.3	175
9/25/2002	21	11:48	12:56	4325.559	7005.83	4328.107	7004.55	0	64	62.7	2.3	175
9/25/2002	22	13:35	14:47	4328.205	6959.148	4330.553	6956.438	0	60	61.6	2.3	175
12/19/02	23	7:34	8:43	4330.374	6954.714	4328.359	6956.606	0	62.8	68.9	2.4	200.0
12/19/02	24	9:06	10:08	4328.220	6956.680	4325.739	6957.830	0	71.3	75.5	2.3	200.0
12/19/02	25**	10:43	11:36	4324.670	6958.400	4326.358	6956.058	0	84.0	80.5	2.3	200.0
12/19/02	26	12:06	12:58	4326.086	6956.277	4327.650	6954.834	0	78.0	77.6	2.3	200.0
1/8/2003	27	7:38	8:40	4331.28	6954.70	4328.70	6955.97	0	62.1	68.8	2.3	200.0
1/8/2003	28	9:08	10:10	4328.73	6956.30	4331.04	6954.80	0	68.3	62.4	2.3	200.0
1/8/2003	29***	10:43	11:35	4331.07	6953.89	4328.64	6958.34	0	62.0	70.1	2.3	200.0

* Tows not included. 2" Cod Ends, 10 - 13, fouled, or twisted net, 25, 29

** twist in net ahead of grate, no catch.

*** fouled net, no catch.

Note: Tows 14, 15 on 9/19/02 were with the Netmind system, Tow 14 with F/V Tenacious, Tow 15 with F/V North Star.

Table 16. Continued. Whiting Grate Raised Footrope Sweepless Trawl Trials: 50 mm Bar Spacing, 2-1/2 Inch Cod End Mesh
2002 Tow Data: F/V Tenacious.

Tow	Whiting kg	Reg. Sp. kg	Total Catch kg	Percent Bycat/Tow Reg.Sp.	Percent Bycat/Trip Reg.Sp.	Comments:
1	28	2	46	3.88		
2	3.4	0	14.1	0.00		
3	50.4	2.45	74.1	3.31		
4	39	1.3	54	2.41	2.94	
5	7.2	0.15	14.7	1.02		Comments Attempt to raise opening of net.
6	113.8	1.45	127.5	1.14		(Placed two three-in-one cans on header rope.)
7	31	0.15	43.9	0.34		
8	27.4	0.95	36.1	2.63		
9	1.95	0.05	8.5	0.59	1.19	
10*	10.5	0.1	112	0.09		*Comment 2 Inch cod ends
11*	22	0.1	34.3	0.29	*	2 Inch cod ends
12*	56	0.45	64.3	0.70	*	2 Inch cod ends
13*	59.5	0.2	67.3	0.30	*	2 Inch cod ends
16	9.4	1.55	17	9.12		
17	26	2.35	43.4	5.42		Comments Variable speeds due to high current wind and swells 2-4ft.
18	5.8	1.1	11.7	9.40	6.93	Comments Variable speeds due to high current wind and swells 2-4ft.
19	62	2.6	90.4	2.88		(Increases in depths over 60 fm show large increase in)
20	84	5.1	110.4	4.62		(by-catch for this region. 'Lot a tide.')
21	13.6	0.7	55.7	1.26		Comments Lots of squalus
22	23.8	0.7	50.5	1.39	2.96	Comments Whiting runs in the summer
23	5.0	2.1	56.4	3.64		
24	10.8	7.9	119.0	6.60		
25**	0.2	0.0	0.2	0**		*Comment Twist in net before grate at start of tow;
26	3.8	1.4	14.6	9.62	5.95	untwisted during haulback; flushed everything out grate hole
27	6.0	2.1	37.0	5.57		
28	7.0	1.6	32.8	4.72		
29***	0.0	0.0	0.0	0***	5.17	*Comment Fouled net; nothing.
Sum	559.30	37.31	1058.20	79.55	25.15	
Mean			3.53	3.79	3.59	

Table 17. Whiting Grate Raised Footrope Sweepless Trawl Tows: Coastal Maine, September, 2002 - January, 2003.
F/V Tenacious. Mean Catch per Tow by Species and Percent Bycatch of Regulated Species.

Date	9/9/2002	9/9/2002	9/9/2002	9/9/2002	9/10/2002	9/10/2002	9/10/2002	9/10/2002	9/10/2002	9/24/2002
Tow Number	1	2	3	4	5	6	7	8	9	16
Species	Wt (kg)	Wt (kg)	Wt (kg)	Wt (kg)	Wt (kg)	Wt (kg)	Wt (kg)	Wt (kg)	Wt (kg)	Wt (kg)
Shrimp	0	0	0	0	0	0	0	0	0	0
Whiting/Silver Hake	28	3.4	50.4	39	7.2	113.8	31	27.4	1.95	9.4
EXP Whiting	28	3.4	50.4	39	7.2	113.8	31	27.4	1.95	9.4
Red Hake (Ling)	9	1.4	2	2.2	0	4.6	1.15	2.4	0.7	1.65
White Hake	0.5	0	1.2	0.3	0	0.25	0.15	0.4	0.05	0.7
Redfish	0.1	0	0	0	0	0	0	0	0	0
American Plaice (Dab)	1	0	1	0.5	0.1	1.05	0	0.55	0	0.6
Gray Sole (Witch Flounder)	0.15	0	0.1	0.35	0.05	0.15	0	0	0	0.25
Windowpane Flounder (Sand Dab)	0	0	0	0	0	0	0	0	0	0
Winter Flounder (Blackback)	0.05	0	0	0	0	0	0	0	0	0
Yellowtail Flounder	0	0	0	0	0	0	0	0	0	0
Cod	0	0	0	0	0	0	0	0	0	0
Haddock	0	0	0	0.15	0	0	0	0	0	0
Pollock	0	0	0.15	0	0	0	0	0	0	0
Herring	0	6.8	16.6	10	4.6	3.6	8	2.6	4.25	0
Alewife	4.6	1.4	2.4	0	2.4	3	2.9	2.2	1.15	0.95
Illex	0.2	0.6	0.2	0.4	0.25	0.505	0.6	0.4	0	0.3
Butterfish	0.9	0.4	0	0	0	0.2	0	0.05	0.05	0.3
Sculpin	0.3	0	0	0	0	0	0	0	0	0
Skate	0	0	0	0	0	0	0	0	0	0
Spiny Dog/Dogfish	0	0	0	0.3	0	0	0	0	0	2.6
Monkfish/Goosefish	0.3	0	0	0.5	0	0	0	0	0	0
Scallop	0	0	0	0.1	0	0	0	0	0	0.25
Mackeral	0	0	0	0	0	0	0	0	0	0
Shad	0.1	0	0	0	0.1	0.35	0.1	0.1	0.15	0
Four Spot Flounder	0.15	0	0	0	0	0	0	0	0	0
Wrymouth	0	0	0	0	0	0	0	0	0	0
Spider Crab	0	0	0	0	0	0	0	0	0	0
Lobster	0.9	0	0	0	0	0	0	0	0.15	0
Jonah Crab	0.15	0.1	0	0.15	0	0	0	0	0	0
Rock Crab	0	0	0	0	0	0	0	0	0	0
Total Catch	46.4	14.1	74.1	54.0	14.7	127.5	43.9	36.1	8.5	17.0
Bycatch Regulated Species	1.8		2.45	1.3	0.15	1.45	0.15	0.95	0.05	1.55
Bycatch Ratio	0.0388	0.0000	0.0331	0.0241	0.0102	0.0114	0.0034	0.0263	0.0059	0.0912

Table 17, Continued. Whiting Grate Raised Footrope Sweepless Trawl Tows: Coastal Maine, September, 2002 - January, 2003.
F/V Tenacious. Mean Catch per Tow by Species and Percent Bycatch of Regulated Species.

9/24/2002	9/24/2002	9/25/2002	9/25/2002	9/25/2002	9/25/2002	12/19/2002	12/19/2002	12/19/2002	1/8/2003	1/8/2003
17	18	19	20	21	22	23	24	26	27	28
Wt (kg)	Wt (kg)	Wt (kg)	Wt (kg)	Wt (kg)	Wt (kg)	Wt (kg)	Wt (kg)	Wt (kg)	Wt (kg)	Wt (kg)
0	0.2	0	0	0	0	4.25	3.05	0.4	19	10
26	5.8	62	84	13.6	23.8	5	10.8	3.75	6	7
26	5.8	62	84	13.6	23.8	5	10.8	3.75	6	7
6.4	4.2	2	5.6	4.35	0.9	0.35	2.8	1	1.2	1.5
0.45	0	1.3	3	0.4	0	1.1	5.2	0.95	0.6	0.5
0	0.05	0	0.05	0	0	0.15	0.05	0	0.11	0
1.65	0.15	0.35	1.9	0.25	0.45	0.75	1.9	0.2	0.85	0.95
0.25	0.35	0.2	0.05	0.05	0.25	0.05	0.4	0.25	0.4	0.1
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0.1	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0.05	0	0	0
0	0.55	0.75	0	0	0	0	0	0	0	0
0	0	0	0.1	0	0	0	0.25	0	0	0
0	0	0.45	0.05	1.35	1.15	0	0	0	0.1	0.2
3.7	0.05	8.8	6.6	7.4	2.75	0	0	0	0	0
1.85	0.05	1.05	2.55	1.75	0.5	0.05	0.5	0	0.1	0
0.9	0.05	0.05	0.05	0.35	0.45	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0.3
0	0	0	0	0	0	0	0	0	0	0
2	0	11.6	3.4	25.4	20.2	42.2	93.4	7.5	8	12
0	0	0	0	0	0	0	0	0	0	0
0.15	0.2	0	0.05	0	0	0.35	0.6	0.05	0.3	0.25
0	0	0	0	0	0	0.15	0	0	0	0.01
0	0	1.85	2.95	0.8	0	0	0	0.05	0	0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0.05	0	0	0	0
0	0	0	0	0	0	0.2	0	0	0	0
0	0	0	0	0	0	0.75	0	0.4	0	0
0	0.05	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0.95	0	0	0.2	0
43.4	11.7	90.4	110.4	55.7	50.5	56.4	119.0	14.6	37.0	32.8
2.35	1.1	2.6	5.1	0.7	0.7	2.05	7.85	1.4	2.06	1.55
0.0542	0.0940	0.0288	0.0462	0.0126	0.0139	0.0364	0.0660	0.0962	0.0557	0.0472

**Table 18. Whiting Grate Raised Footrope Sweepless Trawl Tows,
September, 02 - January, 03. Coastal Maine. F/V Tenacious.
Mean Catch/Tow by Species & % Bycatch Reg. Species**

	Tot Cat/Tow 21 Tows	Mean Cat/Tow kg
Shrimp	36.9	1.76
Whiting/Silver Hake	559.3	26.63
EXP Whiting	559.3	26.63
Red Hake (Ling)	55.4	2.64
White Hake	17.05	0.81
Redfish	0.51	0.02
American Plaice (Dab)	14.2	0.68
Gray Sole (Witch Flounder)	3.4	0.16
Windowpane Flounder (Sand Dab)	0	0.00
Winter Flounder (Blackback)	0.15	0.01
Yellowtail Flounder	0	0.00
Cod	0.05	0.00
Haddock	1.45	0.07
Pollock	0.5	0.02
Herring	59.75	2.85
Alewife	50.3	2.40
Illex	11.855	0.56
Butterfish	3.75	0.18
Sculpin	0.6	0.03
Skate	0	0.00
Spiny Dog/Dogfish	228.6	10.89
Monkfish/Goosefish	0.8	0.04
Scallop	2.3	0.11
mackerel	0.16	0.01
shad	6.55	0.31
Four Spot Flounder	0.15	0.01
Wrymouth	0.05	0.00
Spider Crab	0.2	0.01
Lobster	2.2	0.10
Jonah Crab	0.45	0.02
Rock Crab	1.15	0.05
Total Catch kg	1057.775	50.37
Reg. Sp. Bycatch Total kg	37.31	1.78
Percent Bycatch	3.53	3.53

Table 19. Whiting Grate Raised Footrope Sweepless Trawl Trials: 50mm bar spacing, 2-1/2 inch Cod End Mesh
2002 Tow Data: Whiting Trials: F/V North Star.

Date	Tow	Begin Time	End Time	Begin Lat	Begin Long	End Lat	End Long	Water Temp (oF)	Depth Haul Start (fm)	Depth Haul End (fm)	Tow Speed (kt)	Wire Out (fm)
10/15/2002	1	9:49	10:50	4325.709	7005.87	4323.568	7004.269	0	68	61.7	2.4	200
10/15/2002	2	11:18	12:20	4323.24	7004.6	4321.196	7005.919	0	71	73.8	2.3	200
10/15/2002	3	12:47	13:49	4320.86	7005.71	4318.738	7006.702	0	78	74.5	2.3	225
10/15/2002	4	14:16	15:20	4318.91	7007.12	4320.79	7008.635	0	73	63.5	2.3	200
10/21/2002	5	8:15	9:40	4321.395	7009.031	4318.858	7008.651		65	67	2.5	175
10/21/2002	6	12:40	13:42	4321.435	7009.061	4319.34	7009.946		62	64	2.6	175
10/22/2002	7	8:25	9:30	4323.124	7006.315	4320.615	7006.189	0	68.1	69.9	2.4	200
10/22/2002	8	9:52	10:54	4320.16	7006.02	4317.793	7006.526	0	75	78.8	2.4	225
10/22/2002	9	11:32	12:33	4319.286	7007.847	4321.276	7008.831	0	74.4	59.9	2.4	200*
10/22/2002	10	12:54	13:50	4321.456	7008.018	4323.584	7009.722	0	63.7	54.1	2.4	175
10/23/2002	11	8:57	9:58	4329.293	7003.34	4327.611	7004.903	0	58.4	64.4	2.4	175
10/23/2002	12	10:06	11:08	4327.24	7004.8	4325.193	7005.653	0	67	64.8	2.4	175
10/23/2002	13	11:24	12:24	4324.74	7005.52	4322.62	7006.41	0	67	64	2.4	200
10/23/2002	14	12:43	13:42	4322.85	7006.42	4324.732	7007.764	0	68	58	2.4	175
10/24/2002	15	8:20	9:21	4324.322	7007.143	4321.85	7006.465	0	62.2	68	2.6	175
10/24/2002	16	9:46	10:46	4321.32	7006.22	4319.088	7006.558	0	71	72.2	2.5	200
10/24/2002	17	11:10	12:10	4319.17	7007.26	4320.739	7008.64	0	70	64.1	2.4	175
10/24/2002	18	12:25	13:27	4320.57	7008.82	4318.325	7009.691	0	63	67	2.5	175
10/24/2002	19	13:55	14:10	43189.75	7009.78	0	0	0	61	0	2.4	175
10/25/2002	20	7:47	9:05	4328.776	6958.297	4330.594	6955.092	0	63.9	61.7	2.4	175
10/25/2002	21	9:24	10:27	4330.47	6954.8	4330.98	6955.498	0	63	62.3	2.4	175
10/25/2002	22	10:48	11:52	4330.68	6955.46	4329.003	6957.681	0	62	65.4	2.5	175
10/25/2002	23	12:31	13:35	4330.35	7000.37	4328.416	7002.507	0	61	64.3	2.5	175
10/28/2002	24	8:45	9:49	4330.134	7002.417	4328.136	7004.464	0	57.9	61.7	2.4	175
10/28/2002	25	10:22	12:00	4326.5	7005.25	4324.237	7004.712	0	70	67.5	2.5	200
10/28/2002	26	11:55	12:55	4323.83	7003.29	4324.885	7000.627	0	73	74	2.3	225
10/31/2002	27	7:43	8:50	4328.522	6958.527	4329.68	6955.311	0	67.7	67	2.4	175
10/31/2002	28	9:15	10:13	4329.8	6955.2	4331.526	6954.435		67	59.4	2.4	175
10/31/2002	29	10:35	11:33	4331.13	6954.32	4329.06	6955.99	0	60	65.5	2.4	175
10/31/2002	30	11:58	12:56	4328.7	6956.25	4328.371	6958.965	0	67	63.2	2.5	200
10/31/2002	31	13:18	14:17	4328.54	6958.27	4329.889	6955.678	0	67	65.7	2.4	175
11/1/2002	32	8:34	9:36	4324.258	7007.139	4321.897	7006.456	0	62.8	70.6	2.4	175
11/1/2002	33	9:58	11:00	4322.06	7005.89	4323.955	7004.482	0	76	69	2.4	225
11/1/2002	34	11:22	12:25	4324.24	7004.64	4326.423	7005.578	0	67	65	2.4	200
11/3/2002	35	8:06	9:06	4324.4	7007.193	4321.94	7006.483	0	62.6	71.4	2.4	175
11/3/2002	36	9:33	10:32	4322.11	7006.44	4324.291	7006.99	0	71	63.5	2.4	200
11/3/2002	37	10:57	11:57	4323.66	7006.85	4321.247	7006.475	0	63	68.3	2.4	200
11/3/2002	38	12:29	13:26	4320.32	7006.55	4322.702	7006.651	0	68	66.4	2.4	200
11/3/2002	39	13:52	14:55	4323.03	7006.42	4324.951	7008.275	0	67	55.5	2.4	175
11/20/2002	40	8:03	9:19	4325.52	7005.6	4322.86	7004.75	0	67	70	2.4	0
11/20/2002	41	9:35	10:38	4322.51	7005.02	4320.066	7004.545	0	85	0	2.5	225
11/20/2002	42	10:59	12:02	4319.746	7004.312	4318.041	7002.798	0	89	0	2.5	250
11/20/2002	43	13:05	14:09	4320.356	7006.894	4322.741	7006.775	0	67	0	2.8	200

Mean % Reg Sp per Trip
(Hung Tows Removed)

**Table 19, Continued. Whiting Grate Raised Footrope Sweepless Trawl Trials: 50mm bar spacing, 2-1/2 inch Cod End Mesh
2002 Tow Data: Whiting Trials: F/V North Star.**

Tow	Whiting kg	Reg. Sp. kg	Total Catch kg	Percent Bycat/Tow Reg.Sp.	Percent Bycat/Trip Reg.Sp.	Comments:
1	60	2.8	68.7	4.08		
2	70.7	4.5	93.6	4.81		
3	98	7	148.2	4.72		
4	195.6	5.5	212.4	2.59	3.79	
5	54.85	1	66.2	1.51		
6	80.25	1.1	94.5	1.16	1.51	*Comments: net tangled in gill net
7	76.6	2.85	102	2.79		
8	22.65	23.3	59.9	38.93		Comments: 21.55 kg redfish
9	176.6	6.2	198.6	3.12		
10	52.65	14.25	95.8	14.88	8.97	*Comments: net torn, hole ~10 ft across, V to ~8ft . . .
11	15	1.55	21.7	7.14		(Reason for 9.4 kg flounders? Ghost gear).
12	6.6	2.65	19.5	13.58		
13	42.6	1.05	69.8	1.51		
14	148.8	5.35	202.5	2.64	3.38	
15	105.8	2.4	125.3	1.92		
16	40.8	0.9	50	1.8		
17	163.85	5	185.4	2.7		
18	98.7	2.75	115	2.39		
19	21.2	0.15	22.4	0.67	2.32	*Comments: pulled up after 15 min. b/c of ghost gear -
20	121.45	4.35	134.5	3.24		(fishing vessel using gill nets nearby).
21	79.3	1.6	102.7	1.56		
22	96.9	0.85	123.8	0.69		
23	37.6	2.2	71.3	3.09	2.08	
24	23.5	1.3	33.7	3.86		
25	34.3	1.3	44.2	2.94		
26	68.7	5.4	121.4	4.45	4.01	
27	47.3	0.6	55.4	1.08		
28	47.2	0.1	62.8	0.16		*Comments: Used 2 inch cod end mesh
29	114.8	3.75	132.2	2.84		*Comments: Used 2 inch cod end mesh
30	56.4	0.7	68.9	1.02		*Comments: Used 2 inch cod end mesh
31	35.7	0.5	43.7	1.15	1.08	*Comments: Used 2 inch cod end mesh
32	118.85	6.1	148.9	4.1		
33	36.05	3.95	69.9	5.65		Comments: 1/2 of tow in 80 FA, 2.35 kg white hake
34	73.9	3.4	93.1	3.65	4.31	
35	148	3.4	196.4	1.73		
36	43.2	1.05	87.8	1.2		
37	140	1.85	159.8	1.16		
38	97.2	1.8	111.4	1.62		
39	85.8	3.35	103.4	3.24	1.74	
40	12	0	17.3	0		
41	45.7	8.35	71.3	11.72		Comments: 5.2 kg white hake
42	19.2	59.2	101.8	58.14		Comments: 55 kg redfish
43	24	0.07	30.9	0.23	30.56	
	Sum	205.47	4138.1			
	Mean	5.14	100.49	5.82	5.80	

Table 20. Whiting Grate Raised Footrope Sweepless Trawl Tows, October - November, 2002
F/V North Star. Mean Catch/Tow by Species & % Bycatch Reg. Species

Date	10/15/2002	10/15/2002	10/15/2002	10/15/2002	10/21/2002	10/22/2002	10/22/2002	10/22/2002	10/23/2002
Tow Number	1	2	3	4	5	7	8	9	11
Species	Wt. (kg)	Wt. (kg)	Wt. (kg)	Wt. (kg)	Wt. (kg)	Wt. (kg)	Wt. (kg)	Wt. (kg)	Wt. (kg)
Shrimp	0.05	0.25	0.65	0.05	0.05	0.1	0.35	0.3	0.01
Whiting/Silver Hake	60	70.7	98	195.6	54.85	76.6	22.65	176.6	15
EXP Whiting	60	70.7	98	195.6	54.85	76.6	22.65	176.6	15
Red Hake (Ling)	3.75	15.85	42.2	9	4.9	9.4	7.7	12.2	2.05
White Hake	1.35	3	2	2.35	0.7	2.5	1.4	4.7	1.5
Redfish	0	0.15	1.45	1.2	0.05	0	21.55	0.2	
American Plaice (Dab)	0.75	0.35	1.45	1.25	0.25	0.15	0.15	0.35	0.05
Gray Sole (Witch Flounder)	0	1	2.1	0.7	0	0.2	0.2	0.75	
Windowpane Flounder (Sand Dab)	0	0	0	0	0	0	0	0	0
Winter Flounder (Blackback)	0	0	0	0	0	0	0	0	0
Yellowtail Flounder	0	0	0	0	0	0	0	0	0
Cod	0	0	0	0	0	0	0	0	0
Haddock	0	0	0	0	0	0	0	0	0
Pollock	0.7	0	0	0	0	0	0	0.2	0
Herring	0	0.75	0	0.2	4.25	6.2	4.35	1.3	0.25
Alewife	0.35	0	0	0	0	6	0.25	0	2.75
Illex	0.2	0.1	0.15	0	0.6	0.2	0.3	0.15	0.1
Butterfish	0	0.05	0	0	0	0	0	0	0
Sculpin	0	0	0	0	0	0	0	0	0
Skate	0	0	0	0	0	0	0	0	0
Spiny Dog/Dogfish	1.55	1.4	0	2	0	0	0.95	1.3	0
Monkfish/Goosefish	0	0	0	0	0	0	0	0	0
Scallop	0	0	0.15	0	0	0	0	0	0
mackerel	0	0	0	0	0	0	0	0	0
shad	0	0	0	0	0.5	0.65	0	0	0
Four Spot Flounder	0	0	0	0	0	0	0	0	0
Wrymouth	0	0	0	0	0	0	0	0	0
Spider Crab	0	0	0	0	0	0	0	0	0
Lobster	0	0	0	0	0	0	0	0.55	0
Jonah Crab	0	0	0.05	0.05	0	0	0	0	0
Rock Crab	0	0	0	0	0.05	0	0	0	0
Total Catch	68.7	93.6	148.2	212.4	66.2	102.0	59.9	198.6	21.7
Bycatch Regulated Species	2.8	4.5	7	5.5	1	2.85	23.3	6.2	1.55
Percent Bycatch	4.08	4.81	4.72	2.59	1.51	2.79	38.93	3.12	7.14

Table 20, Continued. Whiting Grate Raised Footrope Sweepless Trawl Tows, October - November, 2002

F/V North Star. Mean Catch/Tow by Species & % Bycatch Reg. Species

10/23/2002	10/23/2002	10/23/2002	10/24/2002	10/24/2002	10/24/2002	10/24/2002	10/25/2002	10/25/2002	10/25/2002	10/25/2002	10/28/2002	10/28/2002
12	13	14	15	16	17	18	20	21	22	23	24	25
Wt. (kg)	Wt. (kg)	Wt. (kg)	Wt. (kg)	Wt. (kg)	Wt. (kg)	Wt. (kg)	Wt. (kg)	Wt. (kg)	Wt. (kg)	Wt. (kg)	Wt. (kg)	Wt. (kg)
0.01	0.45	3	0	0.01	0.1	0.01		0	0	0	0	0.01
6.6	42.6	148.8	105.8	40.8	163.85	98.7	121.45	79.3	96.9	37.6	23.5	34.3
6.6	42.6	148.8	105.8	40.8	163.85	98.7	121.45	79.3	96.9	37.6	23.5	34.3
0.85	2.8	15.6	10.1	5.7	11.9	7.1	6.5	2.2	1.6	1.95	0.85	4.4
2.25	0	3.1	2.1	0	1.3	1.3	3.35	1.45	0.55	1.65	0.7	1.2
0	0	0	0	0.5	0.1	0		0	0	0	0	0
0.15	0.4	1.7	0.2	0.4	1.5	0.5	1	0.15	0.3	0.55	0.6	0.1
0.25	0.5	0.55	0.1	0	1.6	0.35		0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0.6	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0.15	0	0	0	0.5	0	0	0	0	0	0	0
2.6	15.2	20	1.4	1.2	0.8	0.9	0.45	12.8	14.4	8.6	0.2	0.65
4.1	6.8	8.4	4.2	0.4	0.3	3.1	0.85	4.25	7.4	15.4	5.5	1.9
0.1	0	0.95	1.1	0.5	0.5	1.05	0.85	1.85	1.35	0.75	2.05	0.3
0.05	0	0.15	0	0	0	0	0	0	0	0.2	0.1	0.1
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
1.85	0	0	0	0.3	0.1	1.3	0	0	0.4	3.6	0	0.1
0	0	0	0	0	0.6	0	0	0	0	0	0	0
0	0	0	0	0	0.05	0	0	0	0	0	0.05	0
0	0	0	0	0	0	0	0	0.1	0	0	0	0.1
0.7	0.85	0	0.1	0.2	0.1	0	0	0.6	0.9	0.95	0.1	0.1
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0.95
0	0	0	0	0	0.01	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0.2	0	0	0	0	0	0	0	0	0	0
0	0	0	0.2	0	2.1	0.1	0	0	0	0	0	0
19.5	69.8	202.5	125.3	50.0	185.4	115.0	134.5	102.7	123.8	71.3	33.7	44.2
2.65	1.05	5.35	2.4	0.9	5	2.75	4.35	1.6	0.85	2.2	1.3	1.3
13.58	1.51	2.64	1.92	1.80	2.70	2.39	3.24	1.56	0.69	3.09	3.86	2.94

Table 20, Continued. Whiting Grate Raised Footrope Sweepless Trawl Tows, October - November, 2002

F/V North Star. Mean Catch/Tow by Species & % Bycatch Reg. Species

10/28/2002	10/31/2002	11/1/2002	11/1/2002	11/1/2002	11/3/2002	11/3/2002	11/3/2002	11/3/2002	11/3/2002	11/20/2002	11/20/2002	11/20/2002	11/20/2002
26	27	32	33	34	35	36	37	38	39	40	41	42	43
Wt. (kg)	Wt. (kg)	Wt. (kg)	Wt. (kg)	Wt. (kg)	Wt. (kg)	Wt. (kg)	Wt. (kg)	Wt. (kg)	Wt. (kg)	Wt. (kg)	Wt. (kg)	Wt. (kg)	Wt. (kg)
1	0	0.05	1.45	0		0	0	0.05	0.05	0.04	1.01	3.5	0
68.7	47.3	118.85	36.05	73.9	148	43.2	140	97.2	85.8	12	45.7	19.2	24
68.7	47.3	118.85	36.05	73.9	148	43.2	140	97.2	85.8	12	45.7	19.2	24
15.7	1.6	18.8	24.4	11.2	19.6	9.5	12.2	7.2	11.4	5	16.1	17.5	5.7
2	0.4	4.8	2.35	2.7	0.5	0.7	0.7	0.7	0.8	0	5.2	4.1	0
2.6	0	0	0.2	0	0	0.05	0	0.05	0.05	0	3.1	55	0
0.7	0.2	1.2	0.3	0.3	1.6	0.3	0.45	0.25	1.3	0	0	0.05	0.04
0.1	0	0.1	1.1	0.1	1.3	0	0.7	0.8	1	0	0.05	0.05	0.03
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0.2	0	0	0	0
0	0	0	0	0.3	0	0	0	0	0	0	0	0	0
27.2	2.6	0.35	0	1.5	22	32.3	4	3.6	0.5	0	0.03	0.06	0.01
1.6	2.5	3	0	0.75	1.1	0.5	0.7	1.2	0.95	0.04	0	0	0.06
0.7	0	1.65	1.55	1.6	2.2	0.7	0.4	0.2	0.85	0.15	0.05	0.01	1
0.05	0.05	0.05	0	0.2	0	0	0.05	0	0	0.01	0.01	0	0.01
0	0	0	0	0	0	0	0	0	0.1	0	0	0	0
0	0	0	0.5	0	0	0	0	0	0	0	0	2.3	0
0.25	0	0	1.45	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0.25	0	0	0	0	0	0	0	0	0
0	0.05	0	0	0.05	0.05	0	0	0	0	0.01	0.01	0.01	0
0.3	0	0	0	0	0	0.3	0	0	0	0.01	0	0	0
0.4	0.7	0	0	0.2	0	0.2	0.5	0.1	0	0	0	0	0.01
0	0	0	0	0	0	0	0	0	0.3	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0.5	0	0	0	0	0	0.05	0	0	0	0
0.1	0	0	0	0	0.05	0	0.05	0	0	0	0	0.05	0
121.4	55.4	148.9	69.9	93.1	196.4	87.8	159.8	111.4	103.4	17.3	71.3	101.8	30.9
5.4	0.6	6.1	3.95	3.4	3.4	1.05	1.85	1.8	3.35	0	8.35	59.2	0.07
4.45	1.08	4.10	5.65	3.65	1.73	1.20	1.16	1.62	3.24	0.00	11.72	58.14	0.23

Table 21. Whiting Grate Raised Footrope Sweepless Trawl Tows, October - November, 2002. F/V North Star. Mean Catch/Tow by Species & Percent Bycatch of Regulated Species

	Tot.Cat./Tow 36 Tows	Mean Cat/Tow kg
Shrimp	12.55	0.35
Whiting/Silver Hake	2730.1	75.84
Expanded Whiting	2730.1	75.84
Red Hake (Ling)	354.5	9.85
White Hake	63.4	1.76
Redfish	86.25	2.40
American Plaice (Dab)	18.99	0.53
Gray Sole (Witch Flounder)	13.63	0.38
Windowpane Flounder (Sand Dab)	0	0.00
Winter Flounder (Blackback)	0	0.00
Yellowtail Flounder	0	0.00
Cod	0.6	0.02
Haddock	0.2	0.01
Pollock	1.85	0.05
Herring	190.65	5.30
Alewife	84.35	2.34
Illex	24.21	0.67
Butterfish	1.08	0.03
Sculpin	0.1	0.00
Skate	2.8	0.08
Spiny Dog/Dogfish	16.55	0.46
Monkfish/Goosefish	0.85	0.02
Scallop	0.43	0.01
mackerel	0.81	0.02
shad	7.86	0.22
Four Spot Flounder	0.3	0.01
Wrymouth	0.95	0.03
Spider Crab	0.01	0.00
Lobster	0.55	0.02
Jonah Crab	0.85	0.02
Rock Crab	2.7	0.08
Total Catch kg	3617.12	100.48
Reg. Sp. Bycatch Total kg	184.92	5.14
Percent Bycatch	5.11	5.11

Table 22. Whiting Grate Raised Footrope Sweepless Trawl Trials: 50mm bar spacing. Comparison of 3 Inch Cod End Mesh with 2-1/2 Inch Cod End Mesh. Fall, 2002. F/V North Star and F/V Tenacious 16 Paired Tows. Tow Date, Time, Location, Depth, Total Catch, Whiting Catch, Regulated Species Bycatch.

Vessel	Date	Tow	Begin Time	End Time	Begin Lat	Begin Long	End Lat	End Long	Water Temp (oF)	Depth Haul Start (fm)	Depth Haul End (fm)	Tow Speed (kt)	Wire Out (fm)	Tow	Cod End Mesh	Whiting kg	Reg. Sp. kg	Total Catch kg	Percent Bycat/Tow Reg.Sp.	
2-1/2 Inch Cod End Tows																				
Tenacious	11/19/2002	1	8:10	9:10	4328.49	6958.52	4329.93	6955.71		67.2	66	2.4	175	1	2.5	0	0	2.4	0	
Tenacious	11/19/2002	2	9:50	10:50	4330.72	6954.06	4328.38	6956.65		62.8	68.2	2.4	200	2	2.5	9	1.2	21.7	5.53	
North Star	11/19/2002	3	11:37	12:41	4327.744	6954.23	4325.843	6956.515	0	79.4	77.5	2.4	225	3	2.5	94.5	12	145.5	8.25	
North Star	11/19/2002	4	13:16	14:18	4325.45	6957.7	4323.778	7000.046	0	75	78.8	2.4	225	4	2.5	111.2	9.95	152.1	6.54	
North Star	11/19/2002	5	14:53	15:54	4324.85	7000.7	4326.092	6958.24	0	73	69.9	2.4	200	5	2.5	78.4	6	107.8	5.57	
North Star	11/21/2002	6	7:52	8:56	4326.06	6956.82	4327.90	6954.53		77.0		2.3	225	6	2.5	35	5.21	61.6	8.46	
North Star	11/21/2002	7	9:18	10:20	4327.54	6954.75	4325.74	6956.92		76.0	77.0	2.4	225	7	2.5	38	5.91	60.2	9.81	
Tenacious	11/21/2002	8	10:51	11:47	4325.87	6957.33	4324.74	6959.88	0	75.8	73.4	2.3	225	8	2.5	36	1.4	111.7	1.25	
Tenacious	11/21/2002	9	12:15	13:15	4324.96	7000.52	4326.01	6957.83	0	74.6	75	2.3	200	9	2.5	9	2.05	50.8	4.04	
Tenacious	11/21/2002	10	13:38	14:14	4326.2	6957.55	4327.53	6956.93	0	76.7	73.2	2.3	200	10	2.5	1.3	1.5	38.6	3.88	
Tenacious	11/25/2002	11	8:49	9:49	4323.13	7006	4320.84	7005.94		72.1	72.3	2.2	200	11	2.5	5.2	0.95	30.1	3.16	
Tenacious	11/25/2002	12	10:08	11:07	4320.45	7005.79	4318.5	7007.08		76.2	75.3	2.3	225	12	2.5	25	2.35	79.1	2.97	
Tenacious	11/25/2002	13	11:31	12:40	4318.6	7006.9	4320.96	7005.99	0	74.3	73.7	2.3	225	13	2.5	40	2.45	8.44	2.9	
North Star	11/26/2002	14	7:44	8:36	4326.013	7005.585	4324.052	7004.806		66.9	69.4	2.4	200	14	2.5	11	3.55	21.5	16.55	
North Star	11/26/2002	15	8:56	9:43	4324.318	7004.592	4326.059	7005.405		67	68.7	2.4	200	15	2.5	53	20.4	107.9	18.91	
North Star	11/26/2002	16	10:15	11:07	4326.11	7005.48	4327.897	7004.757	0	67	62.6	2.5	200	16	2.5	32	15.4	70.1	21.97	
3 Inch Cod End Tows																				
																		Mean Percent Bycatch		7.99
																		Std. Dev.		6.31
North Star	11/19/2002	1	8:09	9:15	4328.591	6958.266	4330.193	6955.524		67.5	65.1	2.4 - 2.5	175	1	3	4.4	0.3	5.7	5.31	
North Star	11/19/2002	2	9:47	10:52	4330.724	6954.552	4328.503	6956.435		63.5	67.9	2.4 - 2.5	200	2	3	12.85	0.2	15.5	1.29	
Tenacious	11/19/2002	3	11:43	12:45	4328.04	6954.46	4325.73	6956.84	0	79.3	76	2.4	200	3	3	36.4	7	83.1	8.42	
Tenacious	11/19/2002	4	13:18	14:18	4325.68	6957.46	4323.8	6959.84	0	75.6	81.3	2.5	225	4	3	41	2.1	79.7	2.64	
Tenacious	11/19/2002	5	14*53	15:55	4324.6	7000.73	4326.12	6958.54	0	78.2	70.3	2.3	200	5	3	13	0.85	33.8	2.51	
Tenacious	11/21/2002	6	7:50	8:54	4326.29	6957.06	4327.76	6954.83		72.3	74.1	2.2	200	6	3	35.3	3.85	113.2	3.4	
Tenacious	11/21/2002	7	9:21	10:20	4327.77	6954.86	4325.85	6956.92		74.8	75.5	2.3	225	7	3	27	5.1	98.5	5.16	
North Star	11/21/2002	8	10:53	11:45	4325.66	6957.31	4324.77	6959.74	0	76.0	75.4	2.4	225	8	3	90	7.73	119.6	6.46	
North Star	11/21/2002	9	12:15	13:15	4325.03	7000.54	4325.95	6957.89		72.5	76.6	2.4	225	9	3	17	4.35	30.9	14.06	
North Star	11/21/2002	10	13:40	14:40	4326.26	6957.60	4327.80	6958.28		72.0	66.2	2.4	200	10	3	22	112.4	144.8	77.63	
North Star	11/25/2002	11	8:45	9:47	4323.295	7006.313	4320.849	7005.987		68	73	2.4	200	11	3	38.8	2.2	53	4.15	
North Star	11/25/2002	12	10:11	11:11	4320.64	7005.95	4318.598	7007.117		74	76.4	2.4	225	12	3	33.8	4.6	53.3	8.63	
North Star	11/25/2002	13	11:35	12:35	4318.9	7006.65	4321.111	7006.144	0	75	74	2.5	225	13	3	52	1.2	74.2	1.62	
Tenacious	11/26/2002	14	7:48	8:36	4326.93	7005.7	4324.26	7004.92		65.4	69.7	2.3	200	14	3	10.5	1.9	24.6	7.74	
Tenacious	11/26/2002	15	8:58	9:46	4324.15	7004.93	4326.13	7005.49		71.8	67.6	2.3	200	15	3	32.5	8.35	63.4	13.17	
Tenacious	11/26/2002	16	10:10	11:19	4326	7005.46	4327.87	7004.65	0	68.7	63.5	2.3	200	16	3	21	11	54.8	20.09	
																		Mean Percent Bycatch		11.39
																		Std. Dev.		18.39

**Table 23. Catch by Species for Cod End Mesh Comparison, 2-1/2 Inch vs 3 Inch Diamond Mesh.
Whiting Grate Raised Footrope Sweepless Trawl, Coastal Maine, Fall, 2002. 3 Inch Cod End.**

Tow# Vessel Date Tow Duration (min) Species	3" Codend									
	1 NS 11/19/2002 66 Wt(kg)	2 NS 11/19/2002 65 Wt(kg)	3 Ten 11/19/2002 62 Wt(kg)	4 Ten 11/19/2002 60 Wt(kg)	5 Ten 11/19/2002 62 Wt(kg)	6 Ten 11/21/2002 64 Wt(kg)	7 Ten 11/21/2002 59 Wt(kg)	8 NS 11/21/2002 52 Wt(kg)	9 NS 11/21/2002 60 Wt(kg)	10 NS 11/21/2002 60 Wt(kg)
Shrimp	0.05	0.15	0.5	0.75	0.2	0.7	0.6	0.07	0.04	0.06
Whiting/Silver Hake	4.4	12.85	36.4	41	13	35.3	27	90	17	22
EXP Whiting	4.4	12.85	36.4	41	13	35.3	27	90	17	22
Red Hake (Ling)	0.1	1.55	9	6.5	2	11	4	17.2	5	5.5
White Hake	0.15	0	6	1.2	0.2	1.3	3.3	4.3	0	3.5
Redfish	0	0	0	0.1	0	0	0	0.03	4.3	105
American Plaice (Dab)	0.15	0.15	0.4	0.3	0.1	1	0.2	2.1	0.05	2
Gray Sole (Witch Flounder)	0	0	0.6	0.5	0.55	1.55	1.6	1.3	0	1.9
Windowpane Flounder (Sand Dab)	0	0	0	0	0	0	0	0	0	0
Winter Flounder (Blackback)	0	0	0	0	0	0	0	0	0	0
Yellowtail Flounder	0	0	0	0	0	0	0	0	0	0
Cod	0	0	0	0	0	0	0	0	0	0
Haddock	0	0	0	0	0	0	0	0	0	0
Pollock	0	0.05	0	0	0	0	0	0	0	0
Herring	0.2	0.05	1	0	0.78	0.2	0.15	0.02	0	0.02
Alewife	0	0	0	0	0.1	0.45	0	0	0.06	0.01
Illex	0.3	0.25	0.55	0.8	0.5	0.75	0	0.03	0.06	0.05
Butterfish	0.05	0.15	0.55	0.35	0.3	0.25	0.35	0.01	0.02	0.03
Sculpin	0	0	0	0	0	0	0	0	0	0
Skate	0	0	0	0	0	0	0	0	0	0
Spiny Dog/Dogfish	0	0	27	27.7	16	58.6	59.7	4.5	4.3	3.6
Monkfish/Goosefish	0	0	0.55	0.1	0	0.9	0	0	0	0.01
Scallop	0	0	0.15	0.1	0.05	0.6	0.9	0	0.01	0.01
Mackeral	0.15	0.3	0.05	0.1	0.05	0.4	0	0	0.09	1.02
Shad	0.1	0	0	0.12	0	0	0	0.01	0	0.01
Other*	0	0	0.05	0.05	0	0	0.05	0	0	0
Other	0	0	0.05	0	0	0	0	0	0	0.01
Other	0	0	0.2	0	0	0	0.65	0	0	0.04
Lobster	0	0	0	0	0	0	0	0	0	0
Jonah Crab	0	0	0	0	0	0.2	0	0	0	0
Rock Crab	0	0	0	0	0	0	0	0	0	0.02
Total Catch	5.7	15.5	83.1	79.7	33.8	113.2	98.5	119.6	30.9	144.8
Bycatch Ratio	0.053	0.013	0.084	0.026	0.025	0.034	0.052	0.065	0.141	0.776
Bycatch Regulated Species	0.3	0.2	7	2.1	0.85	3.85	5.1	7.73	4.35	112.4
Catch less Spiny Dogfish**	5.7	15.5	56.1	52.0	17.8	54.6	38.8	115.1	26.6	141.2
Bycatch Ratio	0.053	0.013	0.125	0.040	0.048	0.071	0.131	0.067	0.163	0.796

*Other species are mixed between tows and include: Shad, Starfish, Scup, 4 Spot Flounder, Black Sea Bass, Cusk, Jon Dory, Spider Crab, Summer Flounder, Wrymouth, Conch, Sea Robin, Northern Pipefish. Usually 1 per tow.

**Spiny Dogfish retained ahead of grate counted as catch

Table 23, Continued. Catch by Species for Cod End Mesh Comparison, 2-1/2 Inch vs 3 Inch Diamond Mesh.
Whiting Grate Raised Footrope Sweepless Trawl, Coastal Maine, Fall, 2002. 3 Inch Cod End.

3" Codend						Total	Mean/tow	Mean/60min	Tenacious Mean/60min	North Star Mean/60min
11 NS	12 NS	13 NS	14 Ten	15 Ten	16 Ten					
11/25/2002	11/25/2002	11/25/2002	11/26/2002	11/26/2002	11/26/2002					
62	60	60	48	48	69	957	59.8125			
Wt(kg)	Wt(kg)	Wt(kg)	Wt(kg)	Wt(kg)	Wt(kg)					
0.55	0.5	1.5	0.05	1.3	2.45	9.47	0.59	0.59	0.81	0.36
38.8	33.8	52	10.5	32.5	21	487.55	30.47	31.46	27.67	35.26
38.8	33.8	52	10.5	32.5	21	487.55	30.47	31.46	27.67	35.26
9.6	12.4	18.2	1.4	10	8	121.45	7.59	7.78	6.59	8.97
1.4	1.55	0.4	0.45	4.3	5	33.05	2.07	2.12	2.76	1.49
0.05	0	0.3	0	0.15	0	109.93	6.87	6.87	0.04	13.71
0.25	0.4	0.4	0.4	1.1	1.25	10.25	0.64	0.67	0.61	0.72
0.5	0.3	0.1	0.2	1.5	4.75	15.35	0.96	0.95	1.37	0.54
0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00
0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00
0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00
0	0	0	0	1.3	0	1.30	0.08	0.10	0.20	0.00
0	2.35	0	0.85	0	0	3.20	0.20	0.21	0.13	0.29
0	0	0	0	0	0	0.05	0.00	0.00	0.00	0.01
0.3	0.2	0	0	0	0	2.92	0.18	0.18	0.26	0.10
0.75	0.7	0.35	0.25	0.16	0.1	2.93	0.18	0.19	0.14	0.23
0.35	0.55	0.25	0.15	0.5	0.05	5.14	0.32	0.32	0.42	0.22
0	0	0	0	0	0	2.06	0.13	0.13	0.22	0.03
0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00
0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00
0.1	0.35	0.15	10	9	10	231.00	14.44	14.44	27.18	1.71
0	0	0	0.3	0	1	2.86	0.18	0.17	0.34	0.00
0	0.1	0.05	0	0	0.05	2.02	0.13	0.12	0.23	0.02
0.2	0	0.45	0	0.25	0.35	3.41	0.21	0.21	0.15	0.27
0.1	0	0	0	0	0	0.34	0.02	0.02	0.02	0.03
0	0	0	0	0	0	0.15	0.01	0.01	0.02	0.00
0	0	0	0	0	0.15	0.21	0.01	0.01	0.02	0.00
0.05	0.1	0	0	0.05	0.05	1.14	0.07	0.07	0.12	0.02
0	0	0	0	1.15	0	1.15	0.07	0.09	0.18	0.00
0	0	0	0	0.15	0.55	0.90	0.06	0.05	0.11	0.00
0	0	0	0	0	0	0.02	0.00	0.00	0.00	0.00
53.0	53.3	74.2	24.6	63.4	54.8	1047.85	65.49	66.78	69.58	63.98
0.042	0.086	0.016	0.077	0.132	0.201	0.165	0.165	0.164	0.073	0.262
2.2	4.6	1.2	1.9	8.35	11	173.13	10.82	10.93	5.11	16.76
52.9	53.0	74.0	14.6	54.4	44.8	816.9	51.1	52.3	42.4	62.3
0.042	0.087	0.016	0.131	0.153	0.246	0.212	0.212	0.209	0.120	0.269

*Other species are mixed between tows and include: Shad, Starfish, Scup, 4 Spot Flounder, Black Sea Bass, Cusk, Jon Dory, Spider Crab, Summer Flounder, Wrymouth, Conch, Sea Robin, Northern Pipefish. Usually 1 per tow.

**Spiny Dogfish retained ahead of grate counted as catch

Mean % Byc.w/o dog 13.64
Std dev 0.187
Mean % B.w/o hi red 9.24
Std dev 0.065

**Table 24. Catch by Species for Cod End Mesh Comparison, 2-1/2 Inch vs 3 Inch Diamond Mesh.
Whiting Grate Raised Footrope Sweepless Trawl, Coastal Maine, Fall, 2002. 2-1/2 Inch Cod End.**

Tow# Vessel Date	2.5" Codend									
	1	2	3	4	5	6	7	8	9	10
	Ten	Ten	NS	NS	NS	NS	NS	Ten	Ten	Ten
	11/19/2002	11/19/2002	11/19/2002	11/19/2002	11/19/2002	11/21/2002	11/21/2002	11/21/2002	11/21/2002	11/21/2002
	60	60	64	62	61	64	62	56	60	36
	Wt(kg)	Wt(kg)	Wt(kg)	Wt(kg)	Wt(kg)	Wt(kg)	Wt(kg)	Wt(kg)	Wt(kg)	Wt(kg)
Shrimp	0	0.2	2.3	0.95	0.7	1	0.06	0.65	0.5	0.2
Whiting/Silver Hake	0	9	94.5	111.2	78.4	35	38	36	9	1.3
EXP Whiting	0	9	94.5	111.2	78.4	35	38	36	9	1.3
Red Hake (Ling)	0	0.5	30	23.6	18.2	16.5	10.1	3.3	3	0.9
White Hake	0	0.75	7.6	5.5	2.15	2.5	2.2	0.3	0.8	0.65
Redfish	0	0	0.2	0.05	1.7	0.01	0.01	0	0.1	0
American Plaice (Dab)	0	0.35	0.55	2	0.55	1.2	1.2	0.85	0.45	0.2
Gray Sole (Witch Flounder)	0	0.1	3.4	2.4	1.4	1.5	2.5	0.25	0.7	0.05
Windowpane Flounder (Sand Dab)	0	0	0	0	0	0	0	0	0	0
Winter Flounder (Blackback)	0	0	0	0	0	0	0	0	0	0
Yellowtail Flounder	0	0	0	0	0	0	0	0	0	0
Cod	0	0	0	0	0	0	0	0	0	0.6
Haddock	0	0	0	0	0	0	0	0	0	0
Pollock	0	0	0.25	0	0.2	0	0	0	0	0
Herring	0	0	1	0.95	1	0	0.05	0	0	0
Alewife	0.3	0	0	0	1.4	0	0	0.05	0	0.15
Illex	0	0.2	1.45	0.7	1.05	1.5	0.05	0.2	0.23	0
Butterfish	0	0	0.7	0.05	0.2	0.03	0.02	0.15	0.1	0.05
Sculpin	0	0	0	0	0	0	0	0	0	0
Skate	0	0	1.6	0	0	0	0	1.9	0	0
Spiny Dog/Dogfish	2	10.5	1.4	3.8	0	2.3	5	67.9	35.8	33.3
Monkfish/Goosefish	0	0	0	0.35	0	0	0.01	0	0	1
Scallop	0	0.05	0.2	0.1	0.25	0.05	1	0.1	0.05	0.15
Mackerel	0.1	0.05	0.05	0.2	0.2	0.01	0.02	0	0.05	0
Shad	0	0	0.25	0.15	0	0.01	0	0	0	0
Other*	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0.05	0.05	0.05
Lobster	0	0	0	0	0	0	0	0	0	0
Jonah Crab	0	0	0	0.05	0.35	0	0	0	0	0
Rock Crab	0	0	0	0	0	0	0	0	0	0
Total Catch	2.4	21.7	145.5	152.1	107.8	61.6	60.2	111.7	50.8	38.6
Bycatch Ratio	0.000	0.055	0.083	0.065	0.056	0.085	0.098	0.013	0.040	0.039
Bycatch Regulated Species		1.2	12	9.95	6	5.21	5.91	1.4	2.05	1.5
Catch less Spiny Dogfish**	0.4	11.2	144.1	148.3	107.8	59.3	55.2	43.8	15.0	5.3
Bycatch Ratio	0.000	0.107	0.083	0.067	0.056	0.088	0.107	0.032	0.136	0.283

*Other species are mixed between tows and include: Shad, Starfish, Scup, 4 Spot Flounder, Black Sea Bass, Cusk, Jon Dory, Spider Crab, Summer Flounder, Wrymouth, Conch, Sea Robin, Northern Pipefish. Usually 1 per tow.

**Spiny Dogfish retained ahead of grate counted as catch

Table 24, Continued. Catch by Species for Cod End Mesh Comparison, 2-1/2 Inch vs 3 Inch Diamond Mesh.
Whiting Grate Raised Footrope Sweepless Trawl, Coastal Maine, Fall, 2002. 2-1/2 Inch Cod End.

2.5" Codend						Total	Mean/tow	Mean/60min	Tenacious Mean/60min	North Star Mean/60min
11 Ten	12 Ten	13 Ten	14 NS	15 NS	16 NS					
11/25/2002	11/25/2002	11/25/2002	11/26/2002	11/26/2002	11/26/2002					
60	59	69	52	47	52	924.00	57.75			
Wt(kg)	Wt(kg)	Wt(kg)	Wt(kg)	Wt(kg)	Wt(kg)					
0.3	1.2	1.7	1	2.3	2.4	15.46	0.97	1.05	0.59	1.45
5.2	25	40	11	53	32	578.60	36.16	37.08	15.52	57.52
5.2	25	40	11	53	32	578.60	36.16	37.08	15.52	57.52
2.5	8	21	5	31.25	18	191.85	11.99	12.56	4.68	20.07
0.3	1	0.55	3.55	15.2	13.2	56.25	3.52	3.96	0.59	7.22
0.05	0.15	0	0	0.35	0	2.62	0.16	0.17	0.04	0.30
0.5	0.65	0.9	0	1.8	0.95	12.15	0.76	0.82	0.50	1.08
0.1	0.55	1	0	3.05	1.25	18.25	1.14	1.21	0.34	2.01
0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00
0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00
0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00
0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00
0	0	0	0	0	0	0.60	0.04	0.06	0.13	0.00
0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00
0	0	0	0	0	0	0.45	0.03	0.03	0.00	0.05
0	0	0	0.15	0	0	3.15	0.20	0.19	0.00	0.38
0.25	0.3	0	0.2	0.45	0.2	3.30	0.21	0.22	0.14	0.30
0.25	0.6	0.5	0.55	0.4	0.65	8.33	0.52	0.54	0.24	0.80
0	0	0	0	0	0	1.30	0.08	0.09	0.04	0.12
0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00
0	0	0	0	0	0	3.50	0.22	0.22	0.25	0.19
20	41.1	18	0	0	1.4	242.50	15.16	18.96	31.75	1.70
0	0	0	0	0	0	1.36	0.09	0.13	0.21	0.04
0	0.2	0.3	0	0	0	2.45	0.15	0.16	0.12	0.19
0.2	0	0	0	0	0	0.88	0.06	0.06	0.05	0.06
0	0	0	0	0	0	0.41	0.03	0.02	0.00	0.05
0	0	0	0	0.1	0	0.10	0.01	0.01	0.00	0.02
0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00
0	0.05	0.05	0	0	0.05	0.30	0.02	0.02	0.04	0.01
0.45	0	0.4	0	0	0	0.85	0.05	0.05	0.10	0.00
0	0.3	0	0	0	0	0.70	0.04	0.04	0.04	0.05
0	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00
30.1	79.1	84.4	21.5	107.9	70.1	1145.36	71.59	77.66	55.36	93.61
0.032	0.030	0.029	0.166	0.189	0.220	0.079	0.079	0.08	0.03	0.11
0.95	2.35	2.45	3.55	20.4	15.4	90.32	5.645	6.254	1.590	10.662
10.1	38.0	66.4	21.5	107.9	68.7	902.9	56.4	58.7	23.6	91.9
0.094	0.062	0.037	0.166	0.189	0.224	0.100	0.100	0.107	0.067	0.116

*Other species are mixed between tows and include: Shad, Starfish, Scup, 4 Spot Flounder, Black Sea Bass, Cusk, Jon Dory, Spider Crab, Summer Flounder, Wrymouth, Conch, Sea Robin, Northern Pipefish. Usually 1 per tow.

**Spiny Dogfish retained ahead of grate counted as catch

Mean % B w/o dogs 11.54
Std dev 0.072

**Table 25. Catch by Species for Cod End Mesh Comparison,
2-1/2 Inch vs 3 Inch Diamond Mesh. Whiting Grate Raised
Footrope Sweepless Trawl, Coastal Maine, Fall, 2002.**

Species	Sum 16 Tows		Mean Wt./ 60 min. Tow	
	3" Cod End	2.5" Cod End	3" Cod End	2.5" Cod End
	Wt (kg)	Wt (kg)	Wt (kg)	Wt (kg)
Shrimp	9.47	15.46	0.59	1.05
Whiting/Silver Hake	487.55	578.6	31.46	37.08
EXP Whiting	487.55	578.6	31.46	37.08
Red Hake (Ling)	121.45	191.85	7.78	12.56
White Hake	33.05	56.25	2.12	3.96
Redfish*	109.93	2.62	6.87	0.17
American Plaice (Dab)	10.25	12.15	0.67	0.82
Gray Sole (Witch Flounder)	15.35	18.25	0.95	1.21
Windowpane Flounder (Sand Dab)	0	0	0.00	0.00
Winter Flounder (Blackback)	0	0	0.00	0.00
Yellowtail Flounder	0	0	0.00	0.00
Cod	1.3	0.6	0.10	0.06
Haddock	3.2	0	0.21	0.00
Pollock	0.05	0.45	0.00	0.03
Herring	2.92	3.15	0.18	0.19
Alewife	2.93	3.3	0.19	0.22
Illex	5.14	8.33	0.32	0.54
Butterfish	2.06	1.3	0.13	0.09
Sculpin	0	0	0.00	0.00
Skate	0	3.5	0.00	0.22
Spiny Dog/Dogfish	231	242.5	14.44	18.96
Monkfish/Goosefish	2.86	1.36	0.17	0.13
Scallop	2.02	2.45	0.12	0.16
Mackerel	3.41	0.88	0.21	0.06
Shad	0.34	0.41	0.02	0.02
Other**	1.17	0	0.01	0.01
Other	0.21	0	0.01	0.00
Other	0.05	0	0.07	0.02
Lobster	1.15	0.85	0.09	0.05
Jonah Crab	0.9	0.7	0.05	0.04
Rock Crab	0.02	0	0.00	0.00
Total Catch	1047.9	1145.36	66.78	77.66
Bycatch Ratio	0.165	0.079	0.164	0.081
Bycatch Regulated Species	173.13	90.32	10.93	6.25
Total Catch less Spiny Dogfish***	816.9	902.9	52.34	58.70
Bycatch Ratio	0.212	0.100	0.209	0.107

*1 tow with 3 inch cod end had 105kg redfish.

** Other species are mixed between tows and include: Shad, Starfish, Scup, 4 Spot Flounder, Black Sea Bass, Cusk, Jon Dory, Spider Crab, Summer Flounder, Wrymouth, Conch, Sea Robin, Northern Pipefish. Usually 1 per tow.

*** Spiny Dogfish retained ahead of grate counted as catch

Sea Robin, Northern Pipefish. Usually 1 per tow.

*** Spiny Dogfish retained ahead of grate counted as catch

Figure 1. Length Frequency of Selected Species from 30" Raised Footrope with Roller Frame Net (F/V North Star) and from Footrope Down on 10" Roller Frame as Control (F/V Tenacious). Both have 50 mm Bar Space Grates and 2.6 Inch Diamond Mesh Cod Ends.

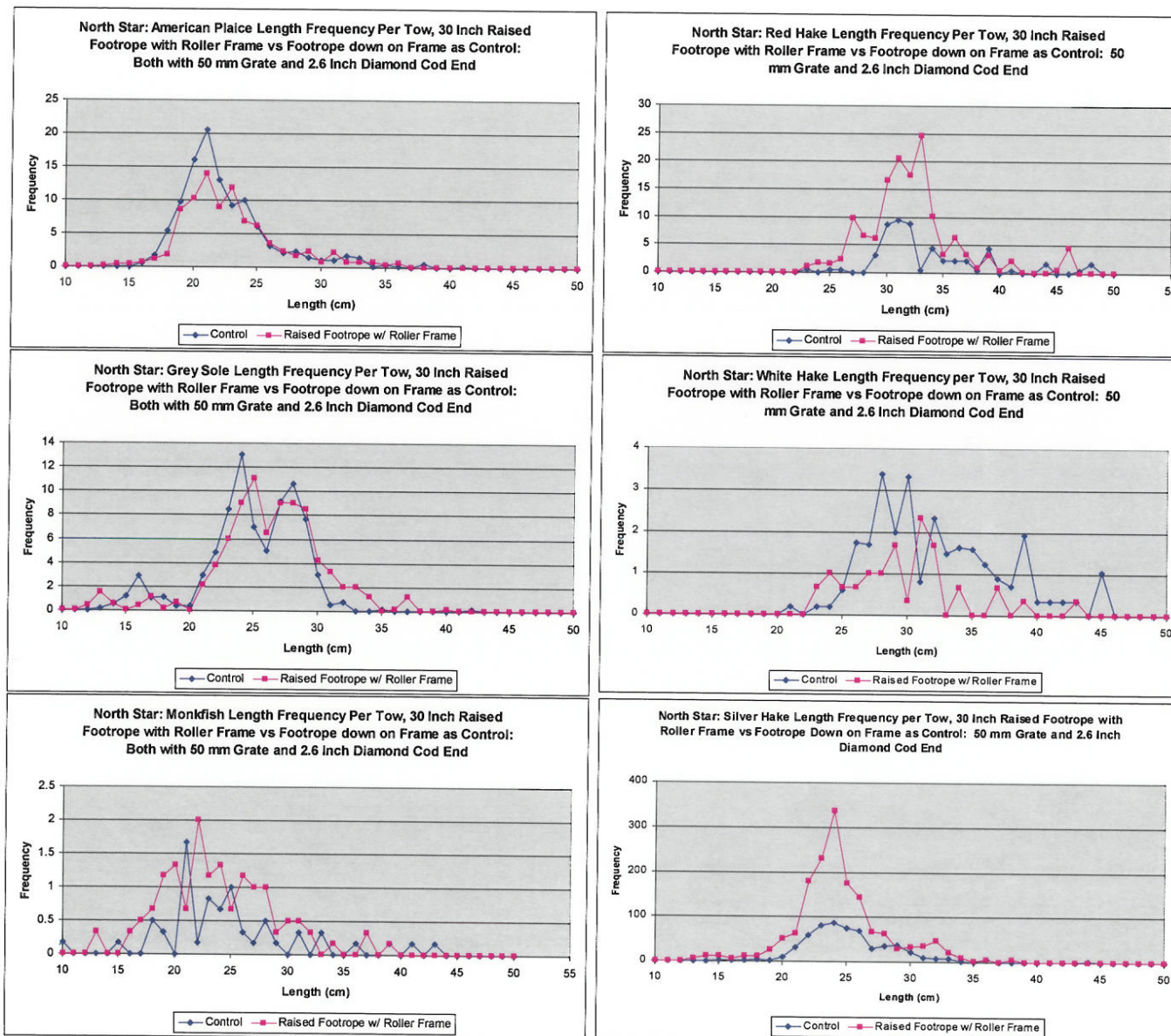


Figure 2. Percent Length Frequency of Selected Species from 30" Raised Footrope with Roller Frame Net (F/V North Star) and from Footrope Down on 10" Roller Frame as Control (F/V Tenacious). Both Have 50 mm Bar Space Grates and 2.6 Inch Diamond Cod Ends.

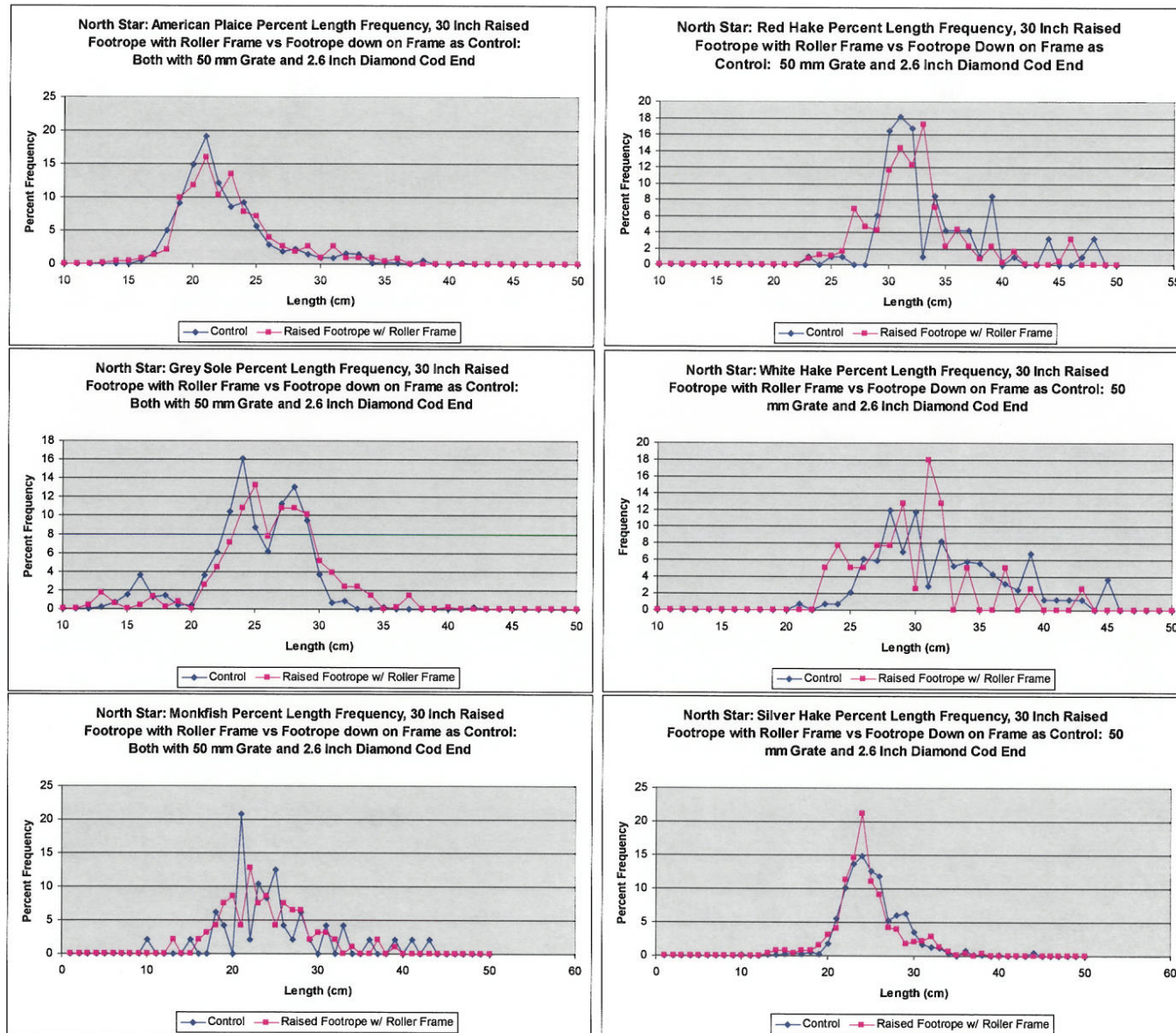


Figure 3. Length Frequency of Selected Species from 30" Raised Footrope with Roller Frame Net (F/V Tenacious) and from Footrope Down on 10" Roller Frame as Control (F/V North Star). Both Have 50 mm Bar Space Grates and 2.6 Inch Diamond Mesh Cod Ends.

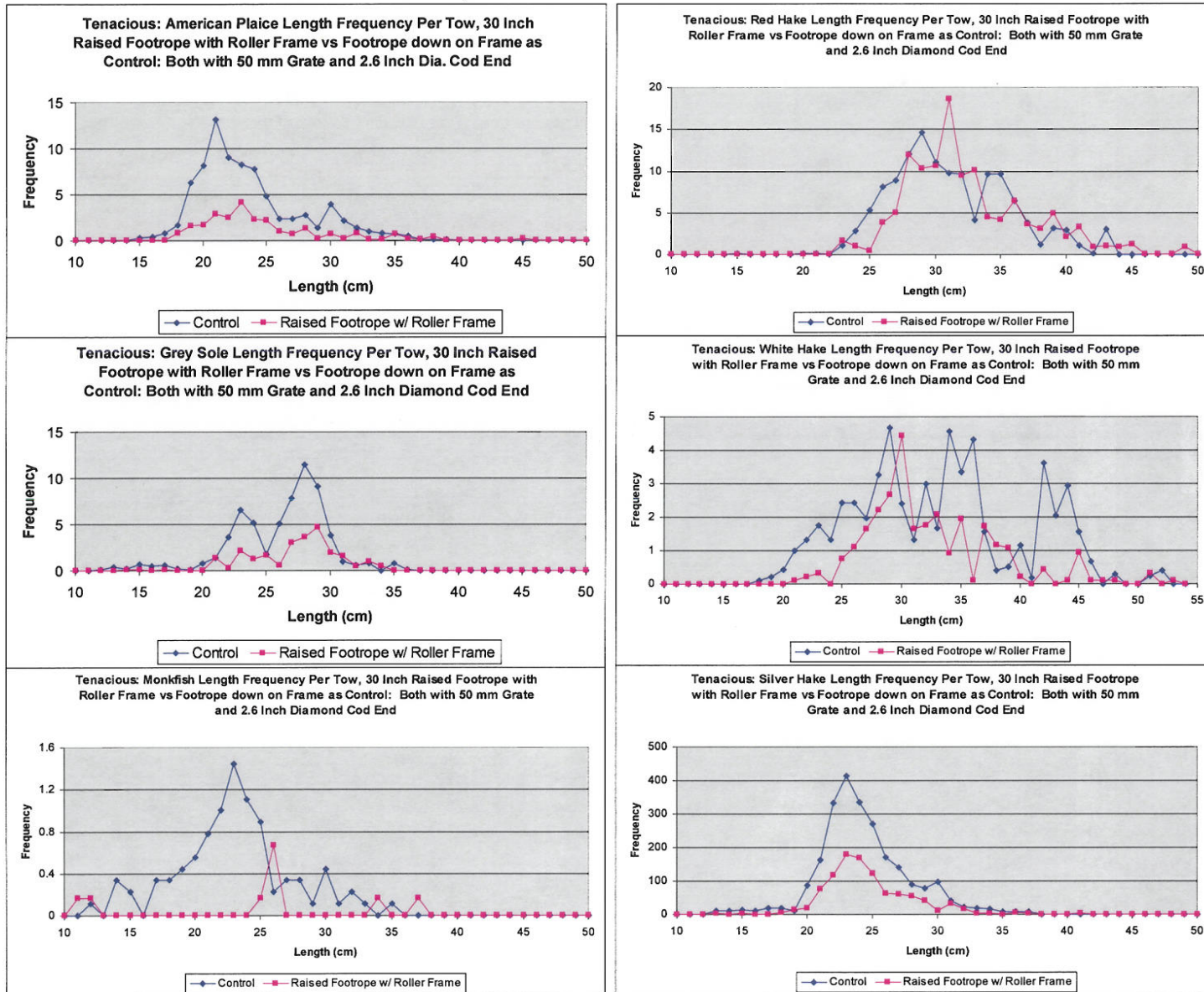


Figure 4. Percent Length Frequency of Selected Species from 30" Raised Footrope with Roller Frame Net (F/V Tenacious) and from Footrope Down on 10" Roller Frame as Control (F/V North Star). Both Have 50 mm Bar Space Grates and 2.6 Inch Diamond Mesh Cod Ends.

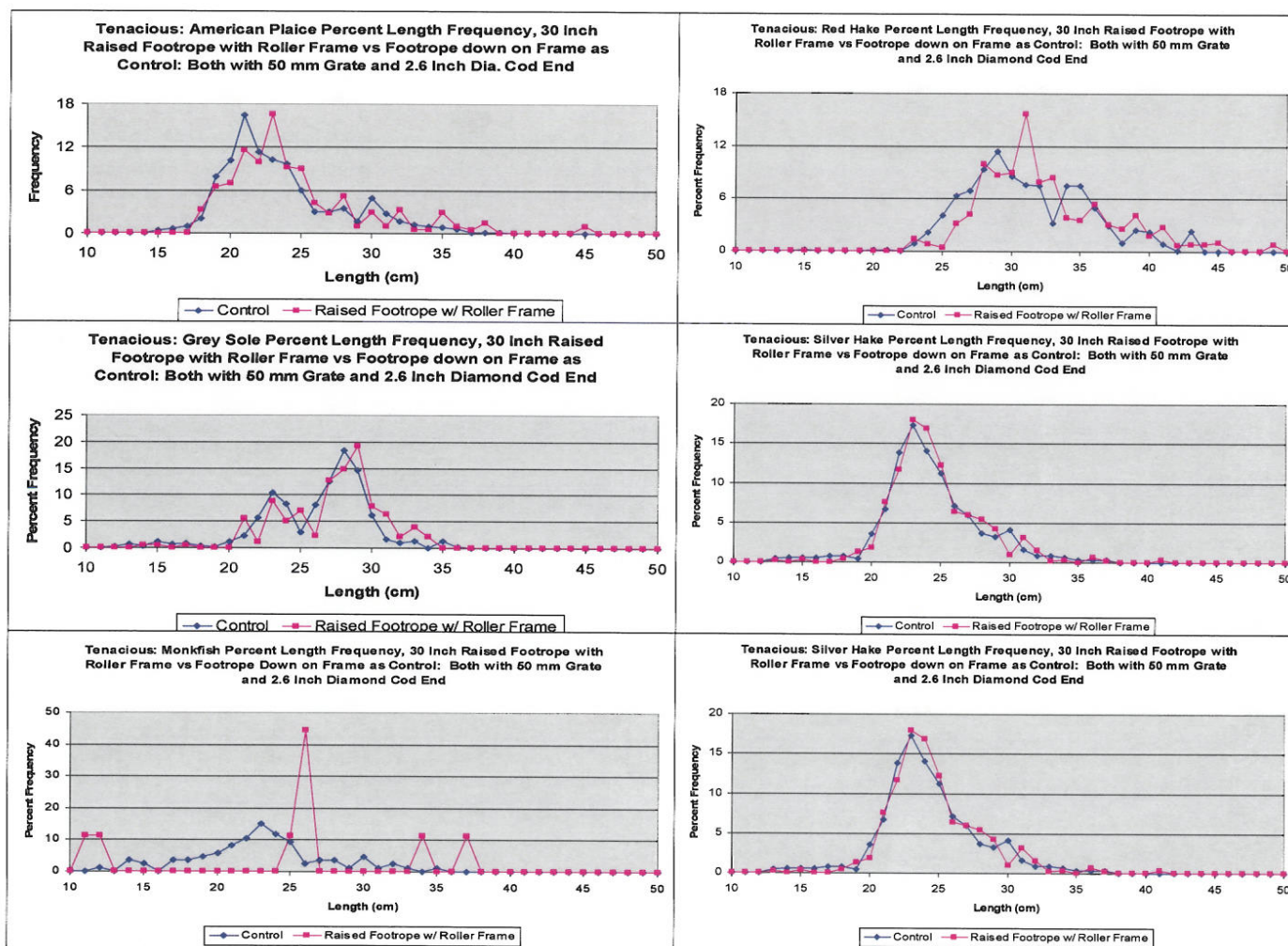


Figure 5. Length Frequency of Selected Species from 30" Raised Footrope with No Roller Frame Net (F/V North Star) and From Footrope Down on 10" Roller Frame and Control (F/V Tenacious). Both Have 50 mm Bar Space Grates and 2.6 Inch Diamond Cod Ends.

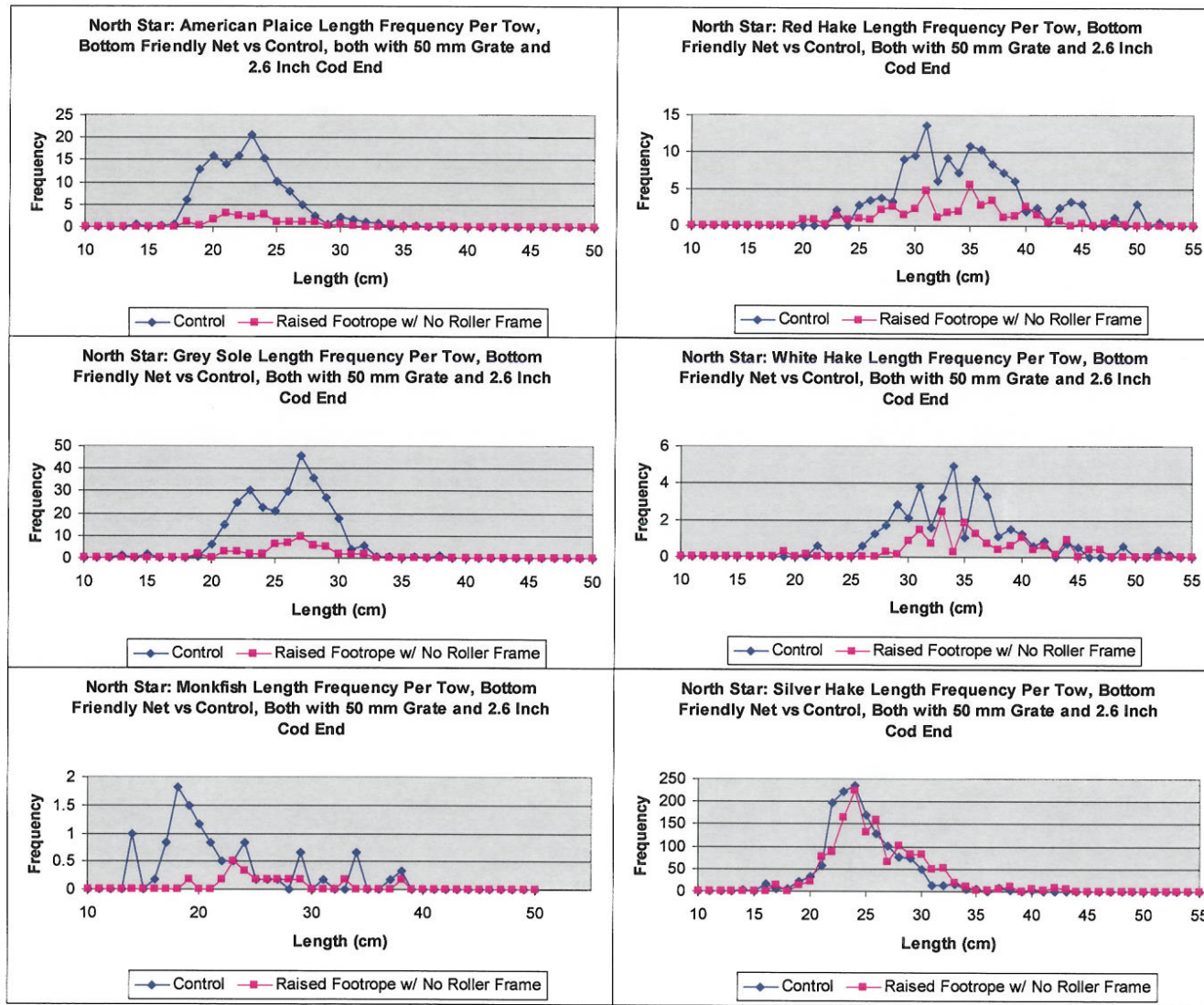


Figure 6. Permit Length Frequency of Selected Species from 30" Raised Footrope with No Roller Frame Net (F/V North Star) and from Footrope Down on 10" Roller Frame as Control (F/V Tenacious). Both Have 50mm Bar Space Grates and 2.6 Inch Diamond Mesh Cod Ends.

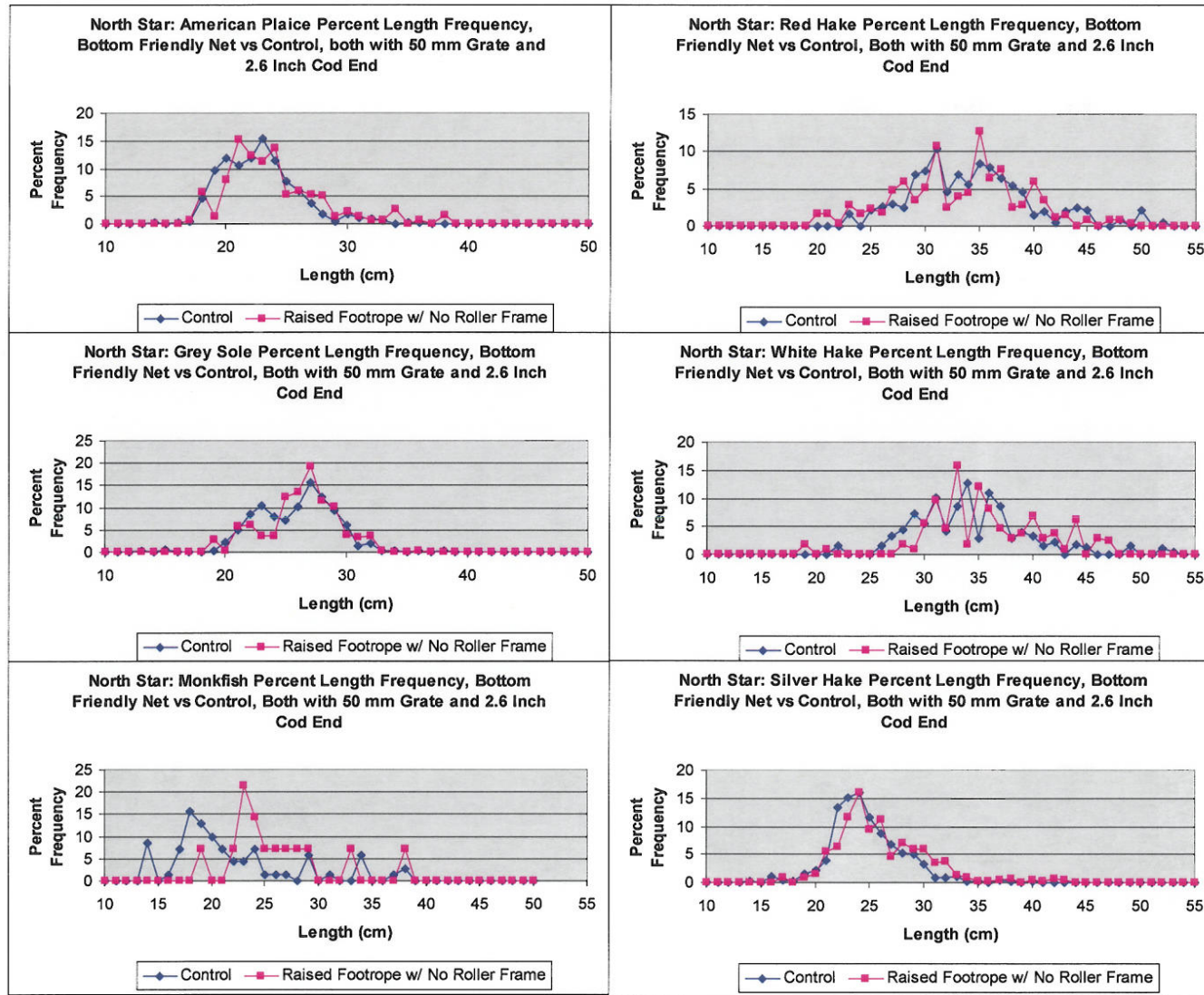


Figure 7. Length Frequency of Selected Species from 30" Raised Footrope with No Roller Frame Net (F/V Tenacious) and from Footrope Down on 10" Roller Frame as Control (F/V North Star). Both Have 50 mm Bar Space Grates and 2.6 Inch Diamond Mesh Cod Ends.

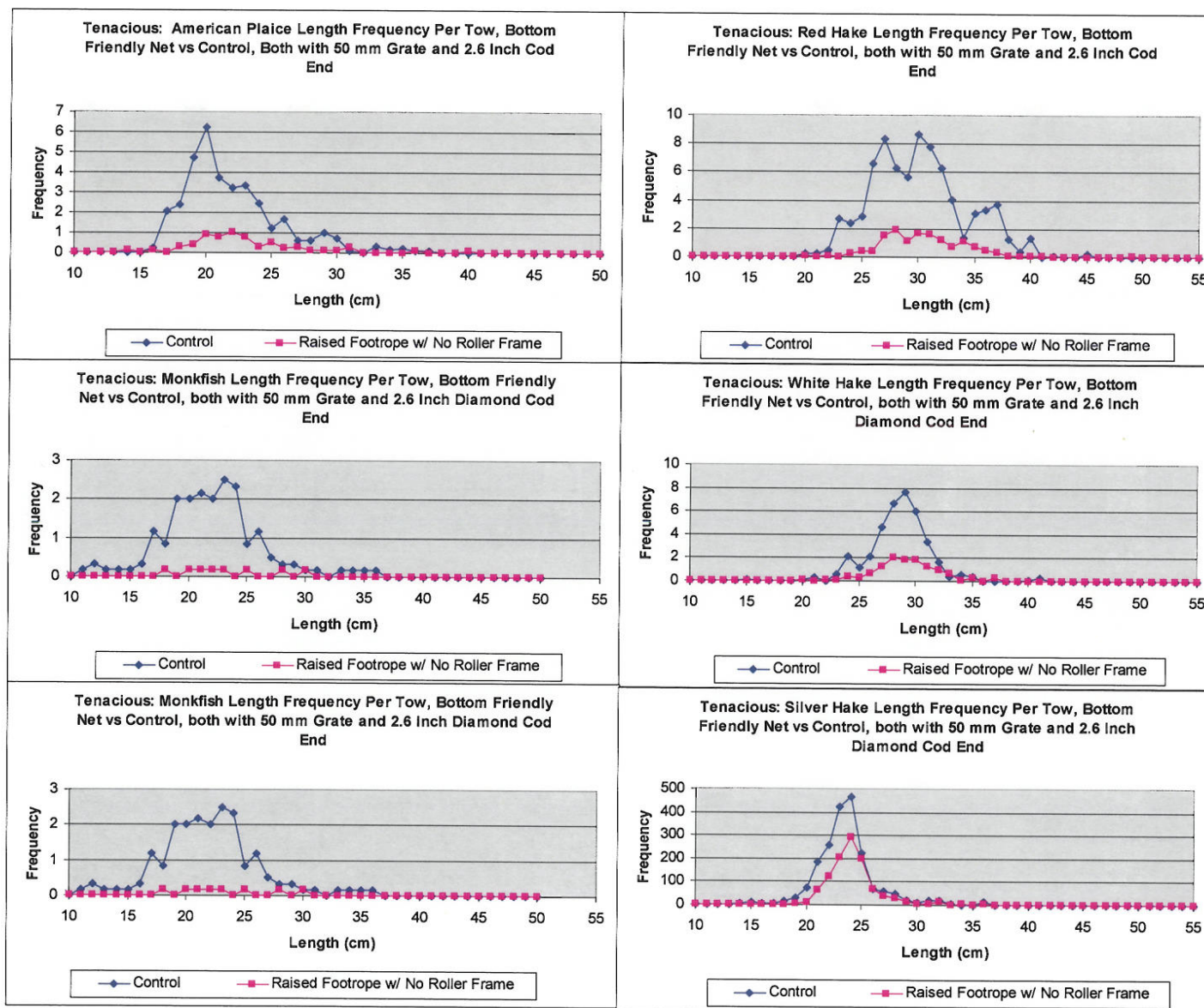


Figure 8. Percent Length Frequency of Selected Species from 30" Raised Footrope with No Roller Frame Net (F/v Tenacious) and from Footrope Down on 10" Roller Frame as Control (F/V North Star). Both Have 50 mm Bar Space Grates and 2.6 Inch Diamond Mesh Cod Ends.

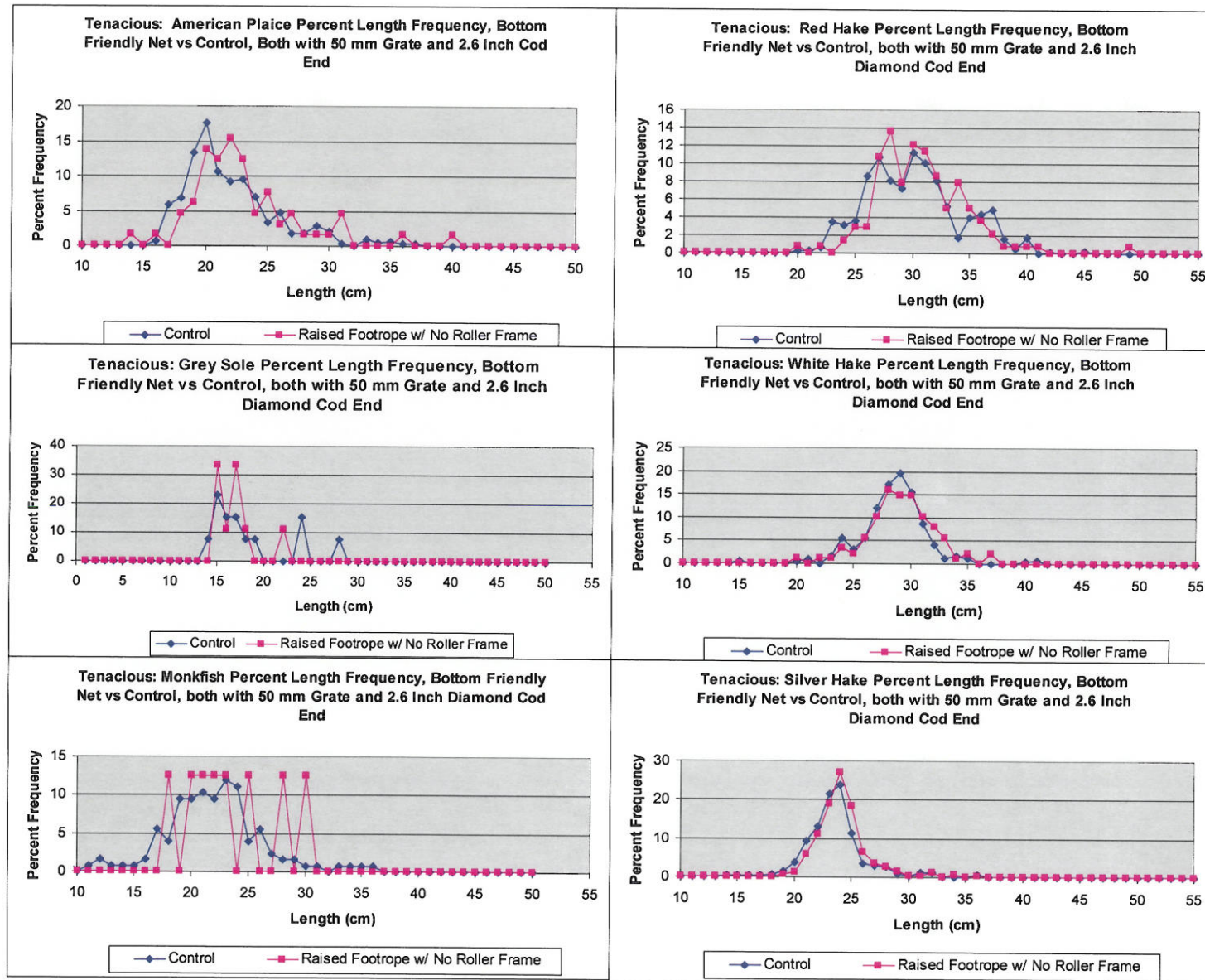
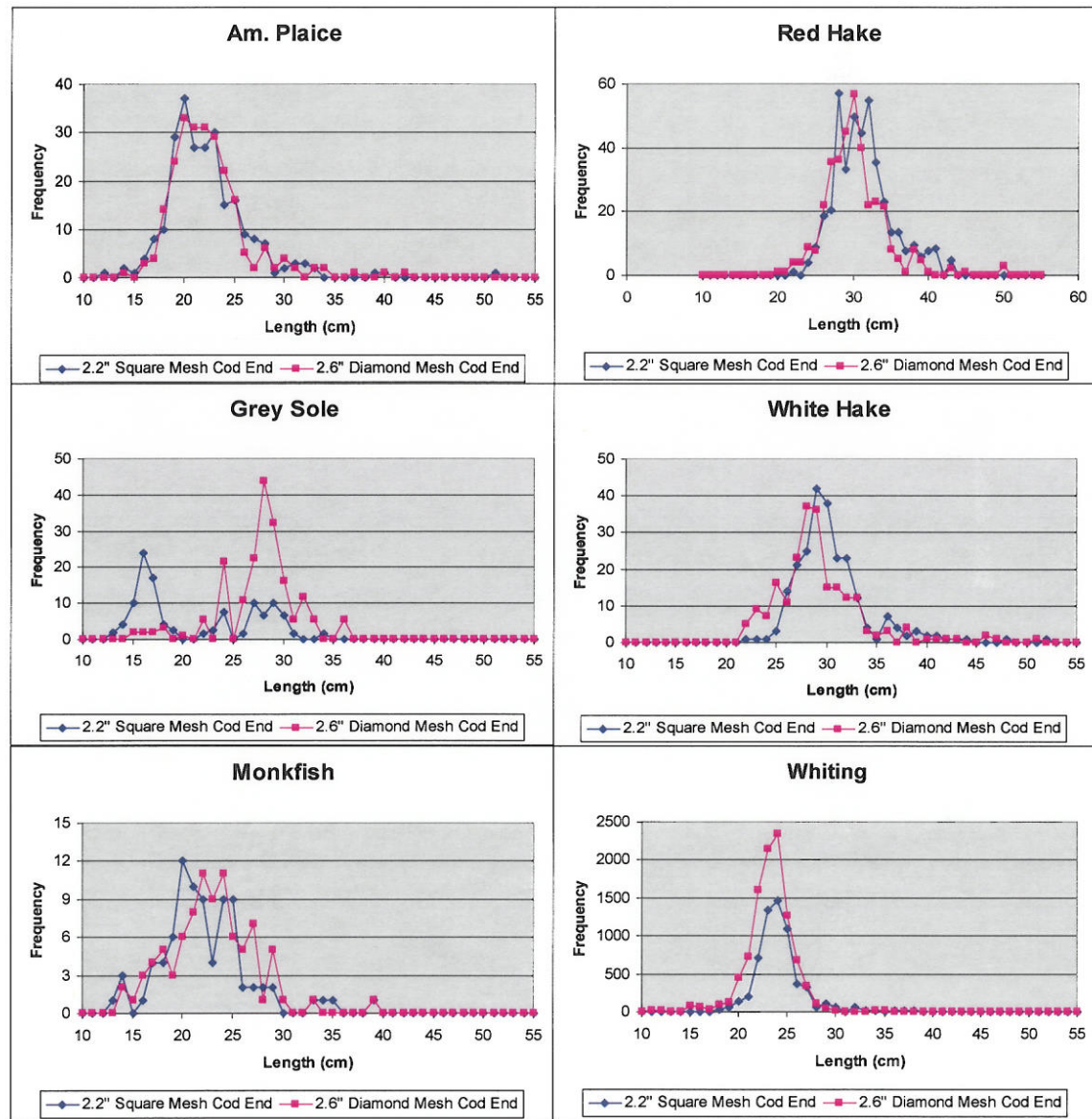
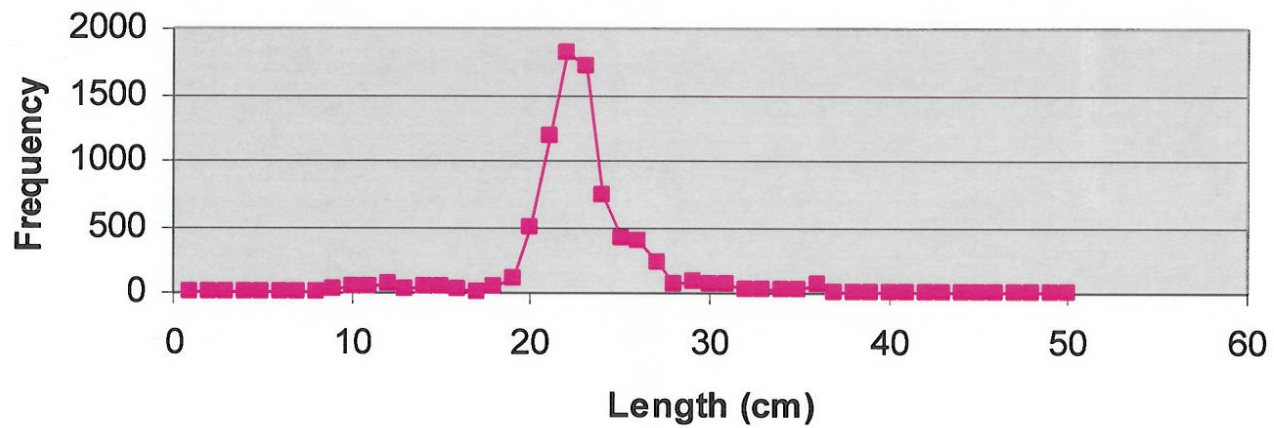


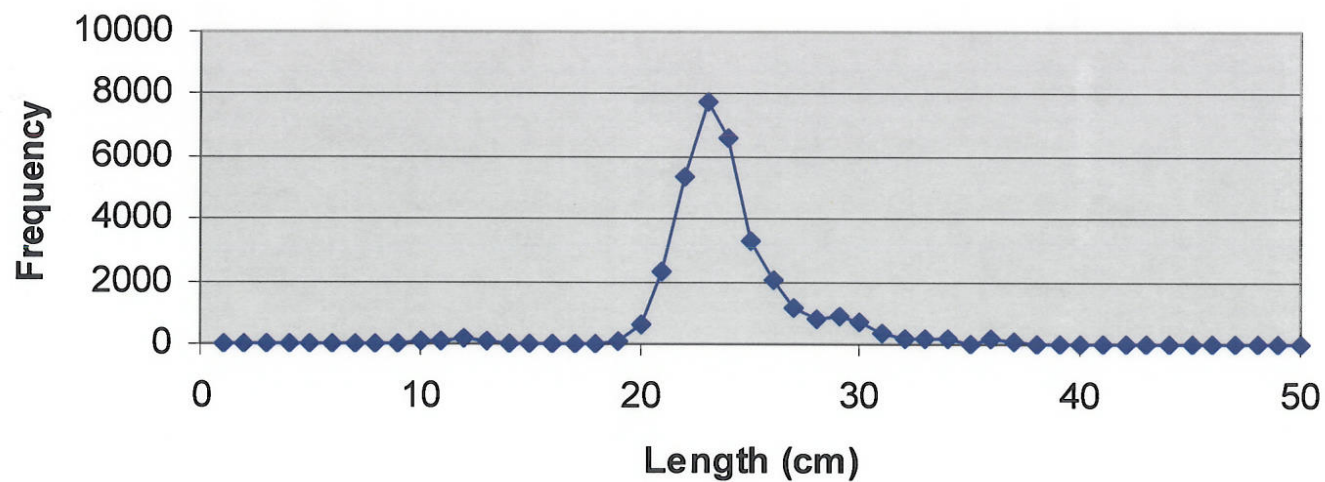
Figure 9. Length Frequency of Selected Species from 2.6 Inch Diamond Mesh and 2.2 Inch Square Mesh Cod Ends. Eight Paired Tows Between F/V Tenacious and F/V North Star Using A Variety of Raised Footrope with and without a Roller Frame and a Footrope Down on the Roller Frame.



**Fig. 10. Whiting Length Frequency from 50 mm Grate,
Raised Footrope Sweepless Trawl:
21 Tows, F/V Tenacious, Coastal Maine, Fall, 2002.**



**Fig. 11. Whiting Length Frequency from 50mm
Grate, Raised Footrope Sweepless Trawl: 36
Tows, F/V North Star, Fall, 2002, Coastal Maine.**



**Fig. 12. Percent LF Whiting, Fall, 2003: Grate Raised
Footrope Sweepless Trawl Trials Maine Coastal
Waters: 71 tows.**

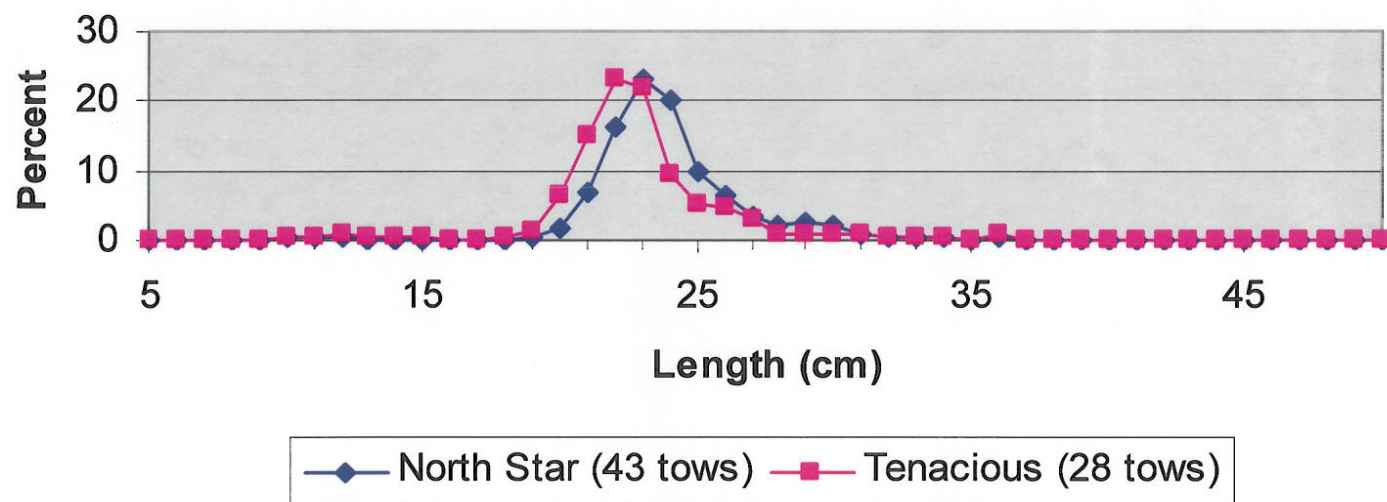


Fig. 13. Regulated Species Length Frequency from 50mm Grate, Raised Footrope Sweepless Trawl: 36 Tows, F/V North Star, Fall, 2002, Coastal Maine.

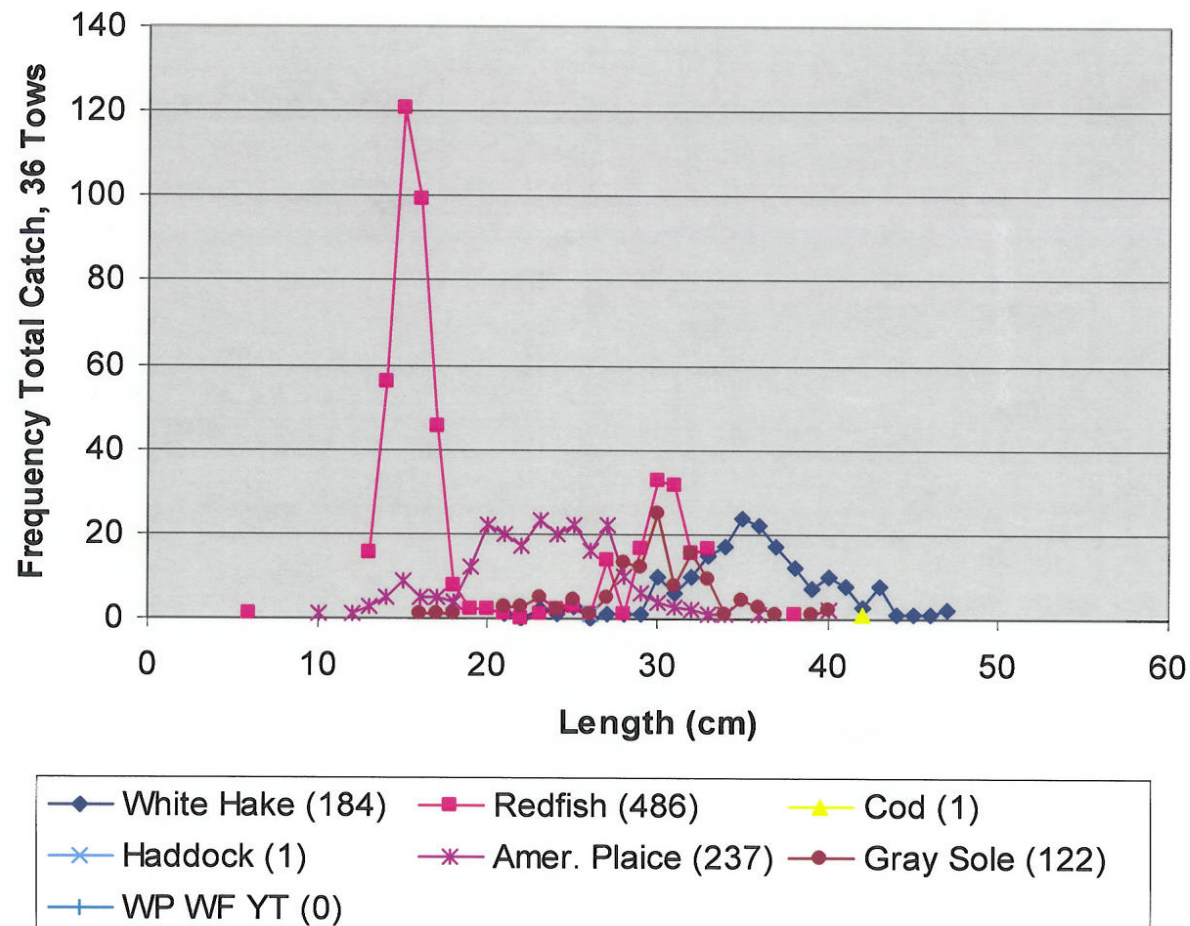


Fig. 14. Frequency of Bycatch of Regulated Species in Year 2002 Tows with Grate Raised Footrope Net. 61 Tows Completed.

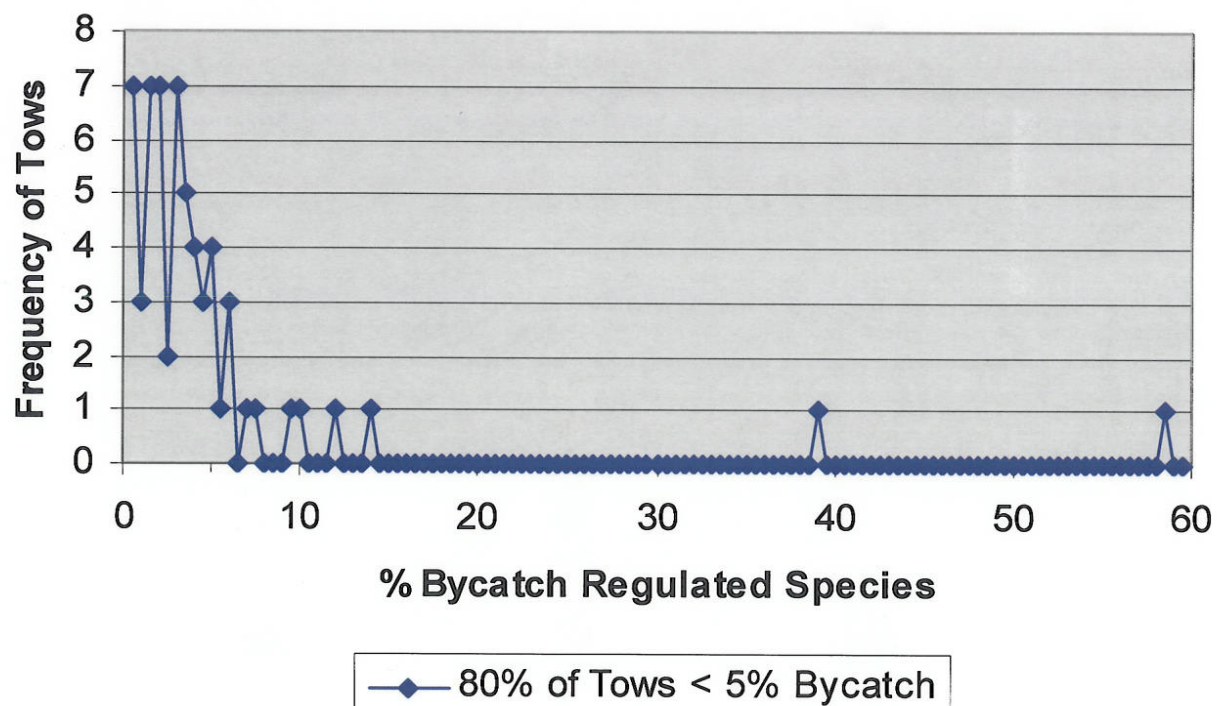
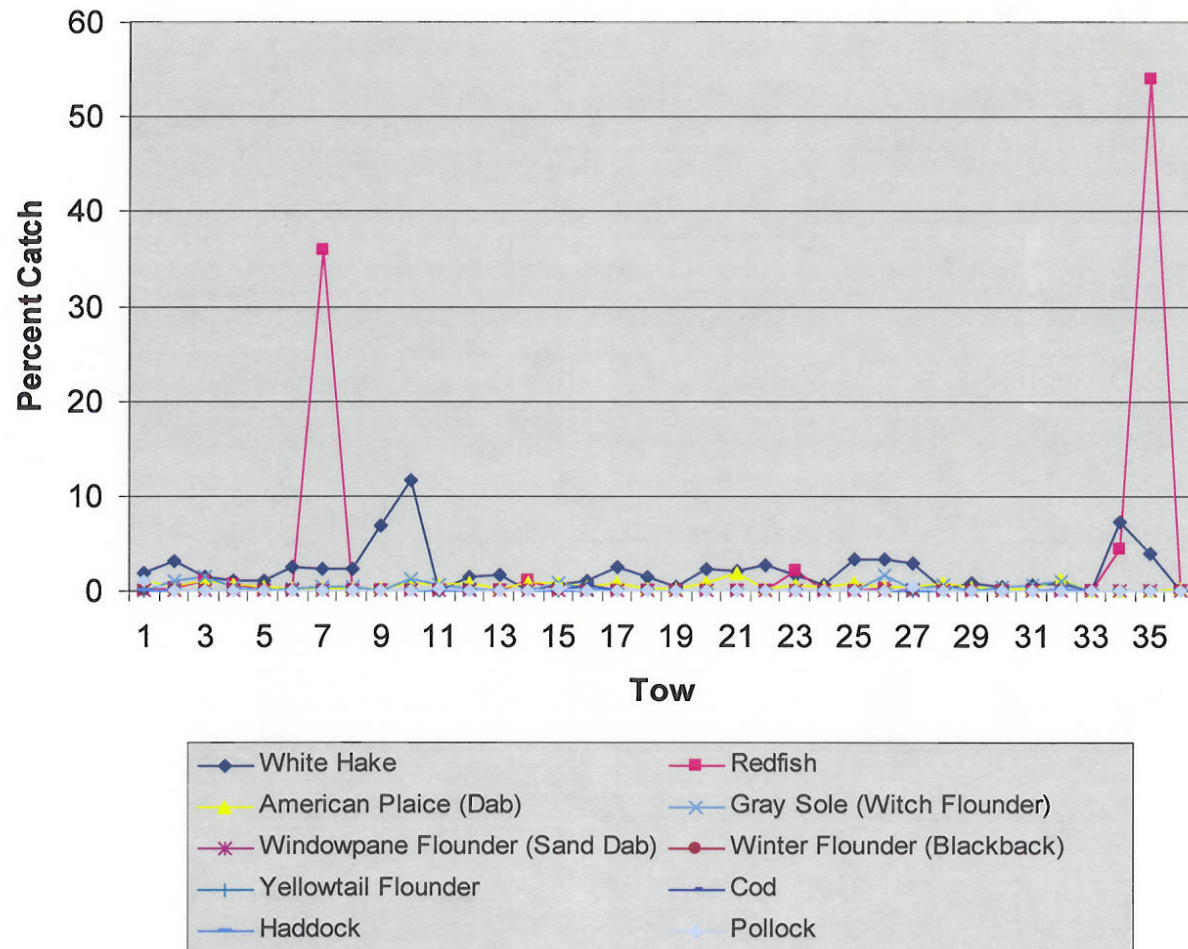


Fig. 15. Whiting Grate Raised Footrope Sweepless Trawl, 36 Tows, F/V North Star, Fall, 2002, Coastal Maine: Percent Catch of Individual Regulated Species per Tow.



**Fig. 16. Percent Bycatch Regulated Species Per
Tow by Depth: September, 02 - January, 03
Whiting Grate Raised Footrope Sweepless Trawl**

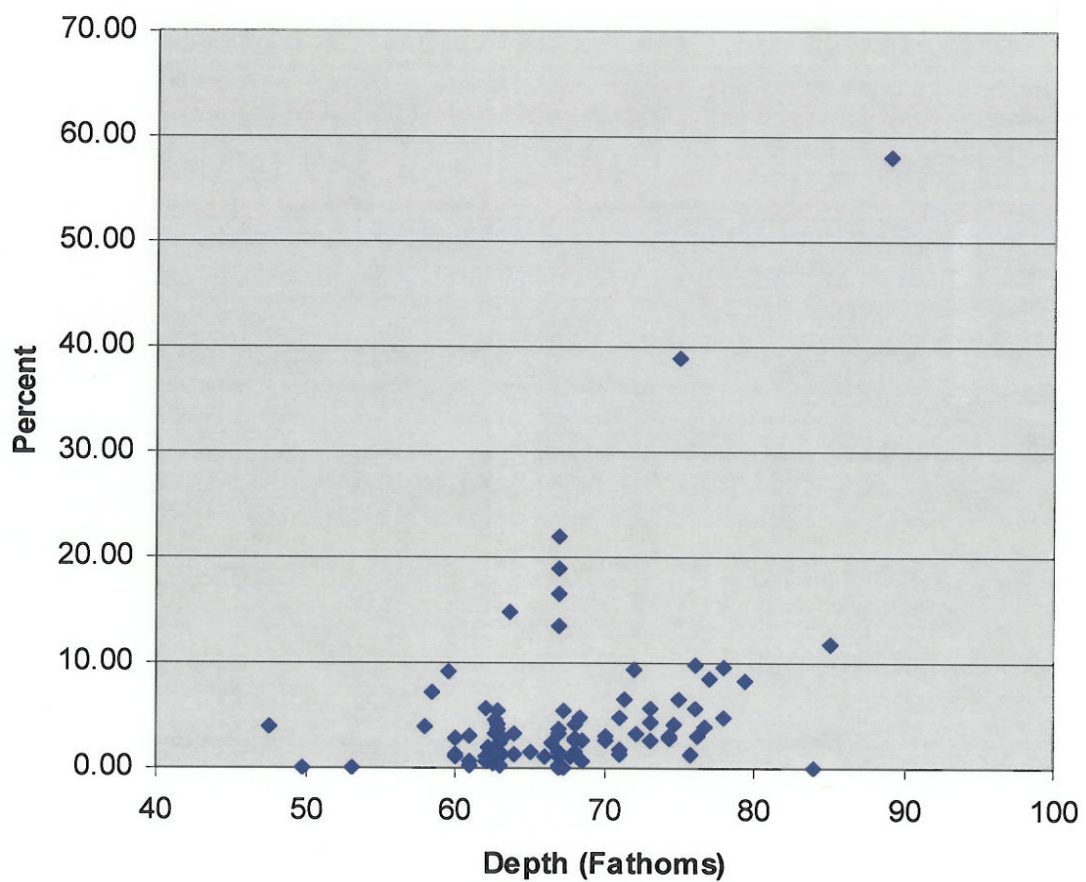
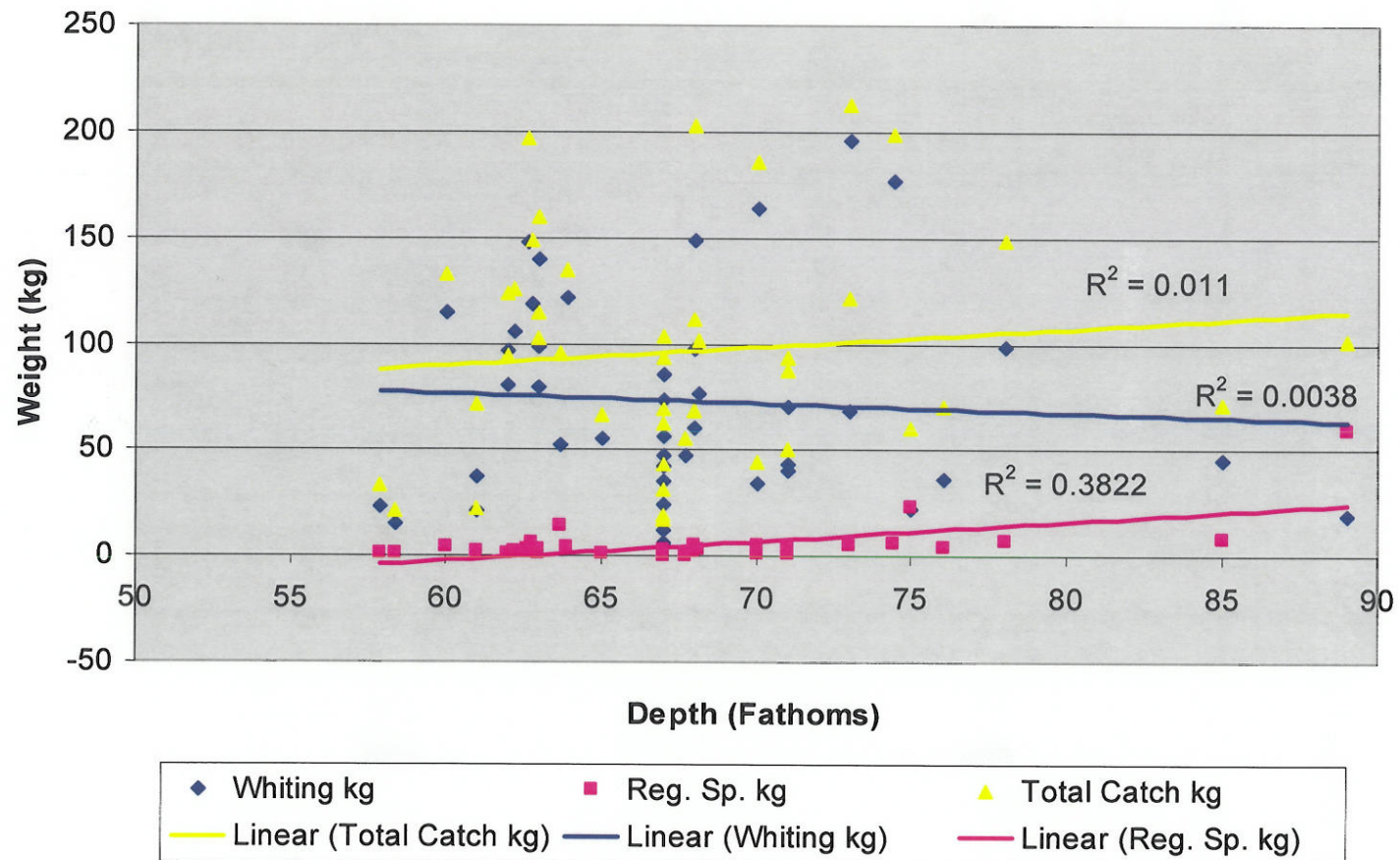
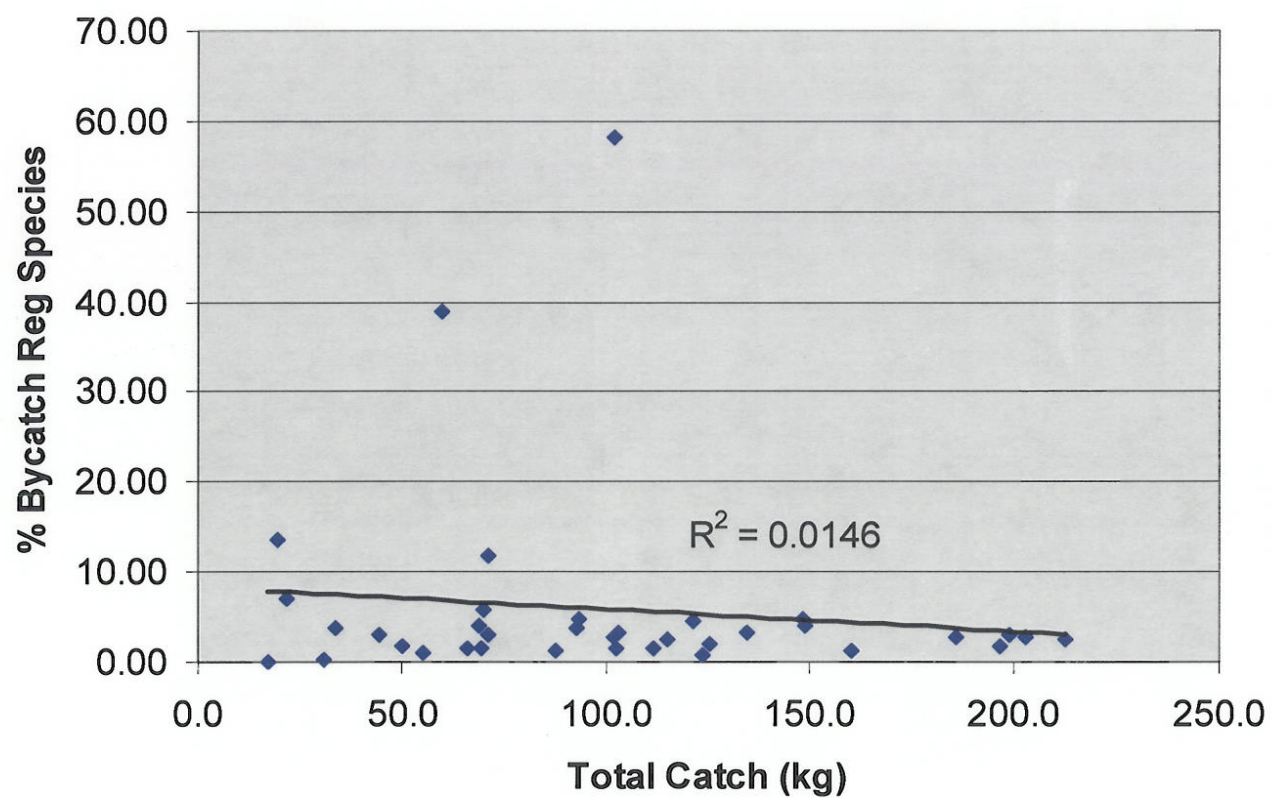


Fig. 17. Whiting Grate Raised Footrope Sweepless Trawl Tows Fall, 2002. Total Catch, Whiting and Regulated Species by Depth



**Fig. 18. Whiting Grate Raised Footrope
Sweepless Trawl, Fall 2002: Percent Bycatch
Reg Sp. Relative to Total Catch**



**Fig. 19. Percent by Wt. Reg. Sp. by Season:
Grate Raised Footrope Whiting Tows: Sept 02 -
Jan 03**

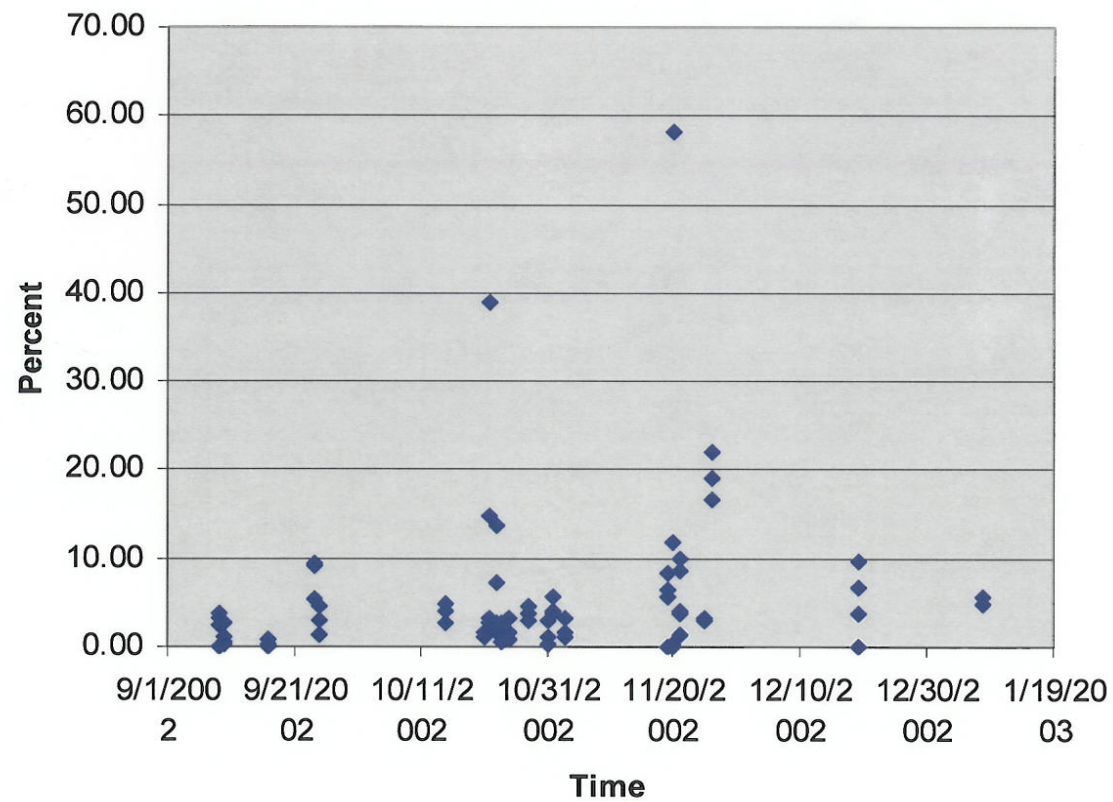


Fig. 20. Whiting Length Frequency: 3" Cod End vs 2.5" Cod End. 16 Paired Tows, Cod End Pairings Evenly Split between Two Vessels.

